

Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Chemicals in Bulk

October 2013

A guide to the Rules

and published requirements

Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquid Chemicals in Bulk

User's guide

These Rules incorporate the amendments of the IBC Code in full at the date of publication. For the purposes of classification with LR and assignment of the notations provided for in LR III, ships for liquid chemicals are required to comply with these Rules and the relevant provisions of LR's *Rules and Regulations for the Classification of Ships*. Classification requirements which are additional to the requirements of the IBC Code have been included as far as practicable in these Rules. All text which does not appear in the IBC Code and all paragraphs which do not appear in the Code are prefixed by 'LR'.

This guide shows the arrangement of contents in respect of Chapters. A comprehensive List of Contents is placed at the beginning of the Rules.

Numbering and Cross-References

A decimal notation system has been adopted throughout. Five sets of digits cover the divisions, i.e. Part, Chapter, Section, sub-Section and paragraph. The textual cross-referencing within the text is as follows, although the right hand digits may be added or omitted depending on the degree of precision required:

- (a) In same Chapter, e.g. see 2.1.3 (i.e. down to paragraph).
- (b) In same Part but different Chapter, e.g. see Ch 3,2.1 (i.e. down to sub-Section).
- (c) In another Part, e.g. see Pt 5, Ch 1,3 (i.e. down to Section).

The cross-referencing for Figures and Tables is as follows:

- (a) In same Chapter, e.g. as shown in Fig 2.3.5 (i.e. Chapter, Section and Figure Number).
- (b) In same Part but different Chapter, e.g. as shown in Fig. 2.3.5 in Chapter 2.
- (c) In another Part, e.g. see Table 2.7.1 in Pt 3, Ch 2.

Rules updating

The Rules are published periodically and changed through a system of Notices. Subscribers are forwarded copies of such Notices when the Rules change.

Current changes to Rules that appeared in Notices are shown with a black rule alongside the amended paragraph on the left hand side. A solid black rule indicates amendments and a dotted black rule indicates corrigenda.

October 2013

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Contents

CHAPTER	LR I	GENERAL REGULATIONS	1
Sections		1 to 8	
CHAPTER	LR II	INTRODUCTION	7
Section	II.1	General	
	II.2	Ship survival capability, fire protection and fire-extinction and operational requirements	
	II.3	Executive responsibility	
	II.4	Chemicals to which the Code does not apply	
	II.5	Units	
CHAPTER	LR III	CLASSIFICATION AND CLASS NOTATIONS	9
Section	III.1	General	
	III.2	Class Notation (refrigerated installation)	
	III.3	Additional notations	
	III.4	Cargoes to be carried	
CHAPTER	LR IV	INFORMATION AND PLANS TO BE SUBMITTED	11
CHAPTER	LR V	STRUCTURAL ARRANGEMENTS AND SCANTLINGS	13
Section	V.1	General	
	V.2	Materials	
	V.3	Longitudinal strength	
	V.4	Hull envelope plating	
	V.5	Hull framing	
	V.6	Double bottom construction	
	V.7	Cargo tank boundaries	
	V.8	Primary structure	
	V.9	Direct calculations	
	V.10	Heated cargoes	
CHAPTER	LR VI	CARGO TANK INERTING ARRANGEMENTS	19
Section	VI.1	Inert Gas Systems	
	VI.2	Nitrogen Generator Systems	
	VI.3	Nitrogen/inert gas systems fitted for purposes other than inerting required by SOLAS Reg. II-2/4.5.5.1.1	
IBC CODE		PREAMBLE	21
CHAPTER	1	GENERAL	23
Section	1.1	Application	
	1.2	Hazards	
	1.3	Definitions	
	1.4	Equivalents	
	1.5	Surveys and certification	

Contents

CHAPTER	2	SHIP SURVIVAL CAPABILITY AND LOCATION OF CARGO TANKS	29
Section	2.1	General	
	2.2	Freeboard and intact stability	
	2.3	Shipside discharges below the freeboard deck	
	2.4	Conditions of loading	
	2.5	Damage assumptions	
	2.6	Location of cargo tanks	
	2.7	Flooding assumptions	
	2.8	Standard of damage	
	2.9	Survival requirements	
CHAPTER	3	SHIP ARRANGEMENTS	33
Section	3.1	Cargo segregation	
	3.2	Accommodation, service and machinery spaces and control stations	
	3.3	Cargo pump-rooms	
	3.4	Access to spaces in the cargo area	
	3.5	Bilge and ballast arrangements	
	3.6	Pump and pipeline identification	
	3.7	Bow or stern loading and unloading arrangements	
CHAPTER	4	CARGO CONTAINMENT	37
Section	4.1	Definitions	
	4.2	Tank type requirements for individual products	
CHAPTER	5	CARGO TRANSFER	39
Section	5.1	Piping scantlings	
	5.2	Piping fabrication and joining details	
	5.3	Flange connections	
	5.4	Test requirements for piping	
	5.5	Piping arrangements	
	5.6	Cargo transfer control systems	
	5.7	Ship's cargo hoses	
CHAPTER	6	MATERIALS OF CONSTRUCTION AND WELDING	43
CHAPTER	7	CARGO TEMPERATURE CONTROL	45
Section	7.1	General	
LR	7.1	General	
LR	7.2	Systems	
LR	7.3	Requirements	
LR	7.4	Cargo temperature measurement	
	7.2	Additional requirements	
CHAPTER	8	CARGO TANK VENTING AND GAS-FREEING ARRANGEMENTS	47
Section	8.1	Application	
	8.2	Cargo tank venting	
	8.3	Types of tank venting systems	
	8.4	Venting requirements for individual products	
	8.5	Cargo-tank gas-freeing	

Contents

CHAPTER	9	ENVIRONMENTAL CONTROL	49
Section	9.1	General	
	9.2	Environmental control requirements for individual products	
CHAPTER	10	ELECTRICAL INSTALLATIONS	51
Section	10.1	General	
	10.2	Bonding	
	10.3	Electrical requirements for individual products	
CHAPTER	11	FIRE PROTECTION AND FIRE EXTINCTION	53
Section	11.1	Application	
	11.2	Cargo pump-rooms	
	11.3	Cargo area	
	11.4	Special requirements	
CHAPTER	12	MECHANICAL VENTILATION IN THE CARGO AREA	55
Section	12.1	Spaces normally entered during cargo-handling operations	
	12.2	Pump-rooms and other enclosed spaces normally entered	
	12.3	Spaces not normally entered	
CHAPTER	13	INSTRUMENTATION	57
Section	13.1	Gauging	
	13.2	Vapour detection	
CHAPTER	14	PERSONNEL PROTECTION	59
Section	14.1	Protective equipment	
	14.2	Safety equipment	
	14.3	Emergency equipment	
CHAPTER	15	SPECIAL REQUIREMENTS	61
Section	15.1	General	
	15.2	Ammonium nitrate solution (93% or less)	
	15.3	Carbon disulphide	
	15.4	Diethyl ether	
	15.5	Hydrogen peroxide solutions	
	15.6	Motor fuel anti-knock compounds (containing lead alkyls)	
	15.7	Phosphorus, yellow or white	
	15.8	Propylene oxide or ethylene oxide/propylene oxide mixtures with an ethylene oxide content of not more than 30% by mass	
	15.9	Sodium chlorate solution (50% or less by mass)	
	15.10	Sulphur (molten)	
	15.11	Acids	
	15.12	Toxic products	
	15.13	Cargoes protected by additives	
	15.14	Cargoes with a vapour pressure greater than 0.1013 MPa absolute at 37.8°C	
	15.15	Cargoes with low ignition temperature and wide flammability range <i>[Deleted]</i>	
	15.16	Cargo contamination	
	15.17	Increased ventilation requirements	

Contents

	15.18	Special cargo pump-room requirements	
	15.19	Overflow control	
	15.20	Alkyl (C ₇ -C ₉) nitrates, all isomers	
	15.21	Temperature sensors	
CHAPTER	16	OPERATIONAL REQUIREMENTS	75
Section	16.1	Maximum allowable quantity of cargo per tank	
	16.2	Cargo information	
	16.3	Personnel training	
	16.4	Opening of and entry into cargo tanks	
	16.5	Stowage of cargo samples	
	16.6	Cargoes not to be exposed to excessive heat	
CHAPTER	17	SUMMARY OF MINIMUM REQUIREMENTS	77
CHAPTER	18	LIST OF PRODUCTS TO WHICH THE CODE DOES NOT APPLY	117
CHAPTER	19	INDEX OF PRODUCTS CARRIED IN BULK	119
CHAPTER	20	TRANSPORT OF LIQUID CHEMICAL WASTES	163
Section	20.1	Preamble	
	20.2	Definitions	
	20.3	Applicability	
	20.4	Permitted shipments	
	20.5	Documentation	
	20.6	Classification of liquid chemical wastes	
	20.7	Carriage and handling of liquid chemical wastes	
CHAPTER	21	CRITERIA FOR ASSIGNING CARRIAGE REQUIREMENTS FOR PRODUCTS SUBJECT TO THE IBC CODE	165
Section	21.1	Introduction	
	21.2	Contents	
	21.3	Minimum safety and pollution criteria for products subject to chapter 17 of the IBC Code	
	21.4	Criteria used to assign the minimum carriage requirements for products, which meet the minimum safety or pollution criteria to make them subject to chapter 17 of the IBC Code	
	21.5	Criteria for special requirements in chapter 15 to be included in <i>column o</i>	
	21.6	Criteria for special requirements in chapter 16 to be included in <i>column o</i>	
	21.7	Definitions	

■ Section 1

1.1 Lloyd's Register Group Limited is a registered company under English law, with origins dating from 1760. It was established for the purpose of producing a faithful and accurate classification of merchant shipping. It now primarily produces classification Rules.

1.2 Classification services are delivered to clients by a number of other members subsidiaries and affiliates of Lloyd's Register Group Limited, including but not limited to: Lloyd's Register EMEA, Lloyd's Register Asia, Lloyd's Register North America, Inc., and Lloyd's Register Central and South America Limited. Lloyd's Register Group Limited, its subsidiaries and affiliates are hereinafter, individually and collectively, referred to as 'LR'.

■ Section 2

2.1 Lloyd's Register Group Limited is managed by a Board of Directors (hereinafter referred to as 'the Board').

The Board has:

appointed a Classification Committee and determined its powers and functions and authorised it to delegate certain of its powers to a Classification Executive and Devolved Classification Executives;

appointed Technical Committees and determined their powers, functions and duties.

2.2 LR has established National and Area Committees in the following:

Countries:

Australia (via Lloyd's Register Asia)
 Canada (via Lloyd's Register North America, Inc.)
 China (via Lloyd's Register Asia)
 Egypt (via Lloyd's Register EMEA)
 Federal Republic of Germany
 (via Lloyd's Register EMEA)
 France (via Lloyd's Register EMEA)
 Italy (via Lloyd's Register EMEA)
 Japan (via Lloyd's Register Group Limited)
 New Zealand (via Lloyd's Register Asia)
 Poland (via Lloyd's Register (Polska) Sp zoo)
 Spain (via Lloyd's Register EMEA)
 United States of America (via Lloyd's Register North America, Inc.)

Areas:

Benelux (via Lloyd's Register EMEA)
 Central America (via Lloyd's Register Central and
 South America Ltd)
 Nordic Countries (via Lloyd's Register EMEA)
 South Asia (via Lloyd's Register Asia)
 Asian Shipowners (via Lloyd's Register Asia)
 Greece (via Lloyd's Register EMEA)

General Regulations

Chapter LR I

Section 3

■ Section 3

3.1 LR's Technical Committee is at present composed of a maximum of 80 members which includes:

Ex officio members:

- Chairman and Chief Executive Officer of Lloyd's Register Group Limited
- Chairman of the Classification Committee of Lloyd's Register Group Limited

Members Nominated by:

- Technical Committee 2
- Royal Institution of Naval Architects 2
- Institution of Engineers and Shipbuilders in Scotland 2
- Institute of Marine, Engineering, Science and Technology 1
- Institute of Materials, Minerals and Mining 2
- Honourable Company of Master Mariners 1
- Institution of Engineering and Technology 1
- Institute of Refrigeration 1
- Welding Institute 2
- Shipbuilders' and Shiprepairers' Association 1
- The Society of Consulting Marine Engineers and Ship Surveyors 1
- Community of European Shipyards Associations 2
- Society of Maritime Industries 1
- European Marine Equipment Council 1
- Chamber of Shipping 1
- Greek Shipping Co-operation Committee 1
- International Association of Oil and Gas Producers 1

3.2 In addition to the foregoing:

- (a) Each National or Area Committee may appoint a representative to attend meetings of the Technical Committee.
- (b) A maximum of five representatives from National Administrations may be co-opted to serve on the Technical Committee. Representatives from National Administrations may also be elected as members of the Technical Committee under one of the categories identified in 3.1.
- (c) Further persons may be co-opted to serve on the Technical Committee by the Technical Committee.

3.3 All elections are subject to confirmation by the Board.

3.4 The function of the Technical Committee is to consider:

- (a) any technical issues connected with LR's marine business;
- (b) any proposed alterations in the existing Rules;
- (c) any new Rules for classification;

Where changes to the Rules are necessitated by mandatory implementation of International Conventions, Codes or Unified Requirements adopted by the International Association of Classification Societies these may be implemented by LR without consideration by the Technical Committee.

3.5 The term of office of the Chairman and of all members of the Technical Committee is five years. Members may be re-elected to serve an additional term of office with the approval of the Board. The term of office of the Chairman may be extended with the approval of the Board.

3.6 In the case of continuous non-attendance of a member, the Technical Committee may withdraw membership.

3.7 Meetings of the Technical Committee are convened as often and at such times and places as is necessary, but there is to be at least one meeting in each year. Urgent matters may be considered by the Technical Committee by correspondence.

3.8 Any proposal involving any alteration in, or addition to, Part 1, Chapter 1 of Rules for Classification is subject to approval of the Board. All other proposals for additions to or alterations to the Rules for Classification other than Part 1, Chapter 1, will following consideration and approval by the Technical Committee either at a meeting of the Technical Committee or by correspondence, be recommended to the Board for adoption.

3.9 The Technical Committee is empowered to:

- (a) appoint sub-Committees or panels; and
- (b) co-opt to the Technical Committee, or to its sub-Committees or panels, representatives of any organisation or industry or private individuals for the purpose of considering any particular problem.

General Regulations

Chapter LR I

Sections 4 & 5

■ Section 4

4.1 LR's Naval Ship Technical Committee is at present composed of a maximum of 50 members and includes:

Ex officio members

- Chairman and Chief Executive Officer of Lloyd's Register Group Limited

Member nominated by:

- Naval Ship Technical Committee;
- The Royal Navy and the UK Ministry of Defence;
- UK Shipbuilders, Ship Repairers and Defence Industry;
- Overseas Navies, Governments and Governmental Agencies;
- Overseas Shipbuilders, Ship Repairers and Defence Industries;

4.2 All elections are subject to confirmation by the Board.

4.3 All members of the Naval Ship Technical Committee are to hold security clearance from their National Authority for the equivalent of NATO CONFIDENTIAL. All material is to be handled in accordance with NATO Regulations or, for non-NATO countries, an approved equivalent. No classified material shall be disclosed to any third party without the consent of the originator.

4.4 The term of office of the Naval Ship Technical Committee Chairman and of all members of the Naval Ship Technical Committee Chairman is five years. Members may be re-elected to serve an additional term of office with the approval of the Board. The term of the Chairman may be extended with the approval of the Board.

4.5 In the case of continuous non-attendance of a member, the Naval Ship Technical Committee may withdraw membership.

4.6 The function of the Naval Ship Technical Committee is to consider technical issues connected with Naval Ship matters and to approve proposals for new Naval Ship Rules, or amendments to existing Naval Ship Rules.

4.7 Meetings of the Naval Ship Technical Committee are convened as necessary but there will be at least one meeting per year. Urgent matters may be considered by the Naval Ship Technical Committee by correspondence.

4.8 Any proposal involving any alteration in, or addition to, Part 1, Chapter 1 of Rules for Classification of Naval Ships is subject to approval of the Board. All other proposals for additions to or alterations to the Rules for Classification of Naval Ships, other than Part 1, Chapter 1, will following consideration and approval by the Naval Ship Technical Committee, either at a meeting of the Naval Ship Technical Committee or by correspondence, be recommended to the Board for adoption.

4.9 The Naval Ship Technical Committee is empowered to:

- (a) appoint sub-Committees or panels; and
- (b) co-opt to the Naval Ship Technical Committee, or to its sub-Committees or panels, representatives of any organisation or industry or private individuals for the purpose of considering any particular problem.

■ Section 5

5.1 LR has the power to adopt, and publish as deemed necessary, Rules relating to classification and has (in relation thereto) provided the following:

- (a) Except in the case of a special directive by the Board, no new Regulation or alteration to any existing Regulation relating to classification or to class notations is to be applied to existing ships.
- (b) Except in the case of a special directive by the Board, or where changes necessitated by mandatory implementation of International Conventions, Codes or Unified Requirements adopted by the International Association of Classification Societies are concerned, no new Rule or alteration in any existing Rule is to be applied compulsorily after the date on which the contract between the ship builder and shipowner for construction of the ship has been signed, nor within six months of its adoption. The date of 'contract for construction' of a ship is the date on which the contract to build the ship is signed between the prospective shipowner and the ship builder. This date and the construction number (i.e. hull numbers) of all the vessels included in the contract are to be declared by the party applying for the assignment of class to a newbuilding. The date of 'contract for construction' of a series of sister ships, including specified optional ships for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective shipowner and the ship builder. In this section a 'series of sister ships' is a series of ships built to the same approved plans for classification purposes, under a single contract for construction. The optional ships will be considered part of the same series of sister ships if the option is exercised not later than 1 year after the contract to build the series was signed. If a contract for construction is later amended to include additional ships or additional options, the date of 'contract for construction' for such ships is the

General Regulations

Chapter LR I

Sections 5 to 8

date on which the amendment to the contract is signed between the prospective shipowner and the ship builder. The amendment to the contract is to be considered as a 'new contract'. If a contract for construction is amended to change the ship type, the date of 'contract for construction' of this modified vessel, or vessels, is the date on which the revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder. Where it is desired to use existing approved ship or machinery plans for a new contract, written application is to be made to LR. Sister ships may have minor design alterations provided that such alterations do not affect matters related to classification, or if the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the ship builder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to LR for approval.

- (c) All reports of survey are to be made by surveyors authorised by members of the LR Group to survey and report (hereinafter referred to as 'the Surveyors') according to the form prescribed, and submitted for the consideration of the Classification Committee.
- (d) Information contained in the reports of classification and statutory surveys will be made available to the relevant owner, National Administration, Port State Administration, P&I Club, hull underwriter and, if authorised in writing by that owner, to any other person or organisation.
- (e) Notwithstanding the general duty of confidentiality owed by LR to its client in accordance with the LR Rules, LR clients hereby accept that, LR will participate in the IACS Early Warning System which requires each IACS member to provide its fellow IACS members and Associates with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and utilised to facilitate the proper working of the IACS Early Warning System LR will provide its client with written details of such information upon sending the same to IACS Members and Associates.
- (f) Information relating to the status of classification and statutory surveys and suspensions/withdrawals of class together with any associated conditions of class will be made available as required by applicable legislation or court order.
- (g) A Classification Executive consisting of senior members of LR's Classification Department staff shall carry out whatever duties that may be within the function of the Classification Committee that the Classification Committee assigns to it.

Section 6

6.1 No LR Group employee is permitted under any circumstances, to accept, directly or indirectly, from any person, firm or company, with whom the work of the employee brings the employee into contact, any present, bonus, entertainment or honorarium of any sort whatsoever which is of more than nominal value or which might be construed to exceed customary courtesy extended in accordance with accepted ethical business standards.

Section 7

7.1 LR has the power to withhold or, if already granted, to suspend or withdraw any ship from class (or to withhold any certificate or report in any other case), in the event of non-payment of any fee to any member of the LR Group.

Section 8

8.1 When providing services LR does not assess compliance with any standard other than the applicable LR Rules, international conventions and other standards agreed in writing.

8.2 In providing services, information or advice, LR does not warrant the accuracy of any information or advice supplied. Except as set out herein, LR will not be liable for any loss, damage or expense sustained by any person and caused by any act, omission, error, negligence or strict liability of LR or caused by any inaccuracy in any information or advice given in any way by or on behalf of LR even if held to amount to a breach of warranty. Nevertheless, if the Client uses LR services or relies on any information or advice given by or on behalf of LR and as a result suffers loss, damage or expense that is proved to have been caused by any negligent act, omission or error of LR or any negligent inaccuracy in information or advice given by or on behalf of LR then LR will pay compensation to the client for its proved loss up to but not exceeding the amount of the fee (if any) charged for that particular service, information or advice.

General Regulations

Chapter LR I

Section 8

8.3 LR will print on all certificates and reports the following notice: Lloyd's Register Group Limited, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as 'Lloyd's Register'. Lloyd's Register assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Lloyd's Register entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

8.4 Except in the circumstances of section 8.2 above, LR will not be liable for any loss of profit, loss of contract, loss of use or any indirect or consequential loss, damage or expense sustained by any person caused by any act, omission or error or caused by any inaccuracy in any information or advice given in any way by or on behalf of LR even if held to amount to a breach of warranty.

8.5 Any dispute about LR services is subject to the exclusive jurisdiction of the English courts and will be governed by English law.

Introduction

Chapter LR II

Sections 1, 2 & 3

LR II.1 General

LR II.1.1 These Rules have been prepared to ensure that Bulk Chemical Tankers built with a view to classification with Lloyd's Register (LR), will also comply with the requirements of the IBC Code,⁽¹⁾ as interpreted by LR, except as provided for in LR II.2 of this introduction.

LR II.1.2 Responsibility for interpretation of IBC Code requirements for the purpose of issuing an International Certificate of Fitness for Chemical Tankers⁽²⁾ lies with the Government of the State whose flag the ship is entitled to fly.⁽³⁾ In this respect, attention is drawn to the IMO document MSC/Circ.406/Rev.1 dated 29th June, 1990 'Guidelines on Interpretations of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and Guidelines for the Uniform Application of the Survival Requirements of the IBC and IGC Codes'. LR will apply these Interpretations for Classification purposes, where applicable. Attention is also drawn to the fact that LR is authorised to issue International Certificates of Fitness on behalf of several National Authorities.

LR II.1.3 The Rules incorporate the amendments of the IBC Code in full at the date of publication. For purposes of classification with LR and assignment of the notations provided for in Chapter LR III, chemical tankers are required to comply with these Rules and the relevant provisions of LR's *Rules and Regulations for the Classification of Ships* (hereinafter referred to as Rules for Ships).⁽⁴⁾ The words 'subject to the Code' where they appear in the text of the Code mean 'subject to these Rules in the context of these Rules'. Classification requirements which are additional to the requirements of the IBC Code have, as far as practicable, been included in these Rules, as sections or paragraphs inserted in appropriate positions in the Code text and are prefixed by 'LR'.

LR II.1.4 When authorised to issue an International Certificate of Fitness, LR will also be required to verify that the Ship Survival Capability and Location of Cargo Tanks requirements contained in Chapter 2 and fire protection and fire-extinction requirements contained in Chapter 11 have been complied with, in addition to classification requirements. On request, such investigations can also be carried out for, or on behalf of, a National Authority which has not authorised LR to issue an International Certificate of Fitness. When requested, LR will also issue an International Statement of Compliance with respect to all or part of the IBC Code, for the purpose of confirming to National Authorities that the ship complies fully with the applicable requirements, as interpreted by LR.

LR II.1.5 Ships built prior to the coming-into-force date of these Rules where the provisions of these Rules have not been applied will continue to be dealt with for classification purposes on the basis of LR's former *Rules for Chemical Tankers* except for fire protection, detection and extinction. In considering new or additional chemical cargoes for inclusion in the cargo lists of these ships, individual consideration, taking account of the ships' arrangements and the nature of the proposed cargoes, will require to be given. LR will carry out surveys for compliance with the *Bulk Chemical Code*⁽⁵⁾ and issue International Certificates of Fitness or Statements of Compliance in a manner similar to that described in LR II.1.4.

LR II.2 Ship survival capability, fire protection and fire-extinction and operational requirements

LR II.2.1 The IBC Code contains requirements in respect of ship survival capability (damage stability), fire protection and fire-extinction and operational matters which are not within the scope of classification as defined in the Rules for Ships, but are the responsibility of the National Authority or Administration, see *also* LR II.3.1, responsible for issuing the International Certificate of Fitness.

LR II.2.2 Accordingly, LR does not require that ship survival capability, fire protection and fire-extinction be investigated for purposes of classification. An asterisk is employed in the ship type notation to indicate that this has not been considered.

LR II.2.3 Similarly, operational requirements which appear in the IBC Code will not be dealt with by LR for classification purposes.

LR II.3 Executive responsibility

LR II.3.1 For the purpose of classification, the definition of Administration, 1.3.2, is to be taken as meaning LR, except insofar as ship survival capability and operational matters are concerned in instances where LR is not responsible for issuing the Certificate of Fitness.

LR II.3.2 For purposes of classification the words 'should be' in the IBC Code text are to be read as 'is to be' or 'are to be', as appropriate.

LR II.3.3 Where, for the purpose of issuing a Certificate of Fitness, a National Authority has specifically accepted an equivalent under the terms of 1.4, or has adopted an interpretation different from that quoted by LR in these Rules, individual consideration will be given to acceptance of the equivalent or interpretation concerned for the purposes of classification.

⁽¹⁾ See definition in LR 1.3(d).

⁽²⁾ See definition in LR 1.3(c).

⁽³⁾ See definition in LR 1.3(e).

⁽⁴⁾ See definition in LR 1.3(f).

⁽⁵⁾ See definition in LR 1.3(a).

Introduction

Chapter LR II

Sections 4 & 5

LR II.4 **Chemicals to which the Code does not apply**

LR II.4.1 Chapter 18 contains a list of chemicals to which the IBC Code does not apply. For classification purposes the carriage of these listed products is therefore not restricted to Chemical Tankers constructed in accordance with these Rules and having class notations as listed in LR III.1.3 and LR III.2.

LR II.5 **Units**

LR II.5.1 SI units, with the equivalent metric units in brackets where applicable, have been used throughout these Rules.

Classification and Class Notations

Chapter LR III

Sections 1 to 4

LR III.1 General

LR III.1.1 The regulations for classification and the assignment of class notations are given in Pt 1, Ch 2,2.3 of the Rules for Ships.

LR III.1.2 Seagoing ships complying with the requirements of these Rules will be eligible to be classed '**100A1 Chemical Tanker ESP**' in association with a Ship Type notation.

LR III.1.3 Seagoing ships complying with the requirements of these Rules and the double hull requirements of Pt 4, Ch 9 of the Rules for Ships which carry MARPOL 73/78 Annex I cargoes as well as chemical cargoes will be eligible to be classed '**100A1 Double Hull Oil and Chemical Tanker ESP**' in association with a Ship Type notation.

LR III.1.4 Sea-going ships complying with the IBC Code as a Type 2 ship and where the ship is registered with a Flag Administration which supports the issuance and maintenance of dual certification for both Ship Type 2 and Ship Type 3 Certificates of Fitness, and where the Flag Administration has agreed to the issuance of dual Certificates of Fitness, will be eligible to be classed **100A1 Chemical Tanker, Ship Type 2 and Ship Type 3, ESP**, or **100A1 Double Hull Oil and Chemical Tanker, Ship Type 2 and Ship Type 3, ESP**, as appropriate.

LR III.1.4.1 Where the ship is later registered with a Flag Administration which does not support the issuance of dual ship Type 2 and Ship Type 3 Certificates of Fitness, the class notation is to be amended accordingly.

LR III.1.5 The notation **ESP** serves to identify the ship as being subject to an Enhanced Survey Programme as detailed in Pt 1, Ch 3,3 and Ch 3,6, see also Pt 1, Ch 2,2.3.12 of the Rules for Ships.

LR III.1.6 Where a Certificate of Fitness has been issued by LR, as provided for in LR II.1.5, the notations **Ship Types 1, 2, or 3** will be assigned as appropriate. Where the Certificate of Fitness is issued by the appropriate National Authority, the notations **Ship Type 1*, 2* or 3*** will be assigned. As the provisions outlined in LR II.2 of these Rules are not required for classification, an asterisk is employed to indicate that the IBC Code requirements in these respects have not been verified by LR for the purposes of classification.

LR III.1.7 The assignment of a Ship Type notation will not imply that the ship is suitable for all cargoes listed in Chapter 17 as requiring that Ship Type. Please refer to the list of Products in the International Certificate of Fitness. See Chapter 6.

LR III.2 Class Notation (refrigerated installation)

LR III.2.1 The following class notations may be assigned as considered appropriate by the Committee, on application from Owners:

✱ Lloyd's RMC (BC)

This notation will be assigned to a classed chemical tanker, in which refrigeration equipment has been constructed, installed and tested in accordance with the relevant requirements of the Rules.

Lloyd's RMC (BC)

This notation will be assigned to a classed chemical tanker, where the equipment has been found equivalent to Rule requirements and tested in accordance with the relevant requirements of the Rules.

TC This notation will be assigned to a classical chemical tanker, where temperature control systems have been found equivalent to Rule requirements and tested in accordance with the relevant requirements of the Rules.

LR III.3 Additional notations

LR III.3.1 Additional notations may be given for the following features:

LR III.3.1.1 Independent tanks, where fitted.

LR III.3.1.2 Maximum permissible relative density (specific gravity) for which the scantlings have been approved, where greater than 1,025, e.g., 'SG 2,0'.

LR III.3.1.3 Maximum permissible positive pressure/vacuum relief valve setting for which the scantlings have been approved, where greater than 0,21 bar gauge, e.g., 'pv+0,4 bar gauge'.

LR III.3.1.4 Tanks constructed of corrosion resistant materials, e.g., stainless steel ('CR(s.stl)'), or lined with corrosion resistant linings, e.g. rubber lining ('CR(r.l)').

LR III.3.2 Maximum temperature for which the scantlings have been approved, e.g., Maximum Temperature 80°C.

LR III.3.3 Where these features are confined to certain tanks, the tanks concerned will be identified in the notation, e.g., 'CR(s.stl), SG 1,85, 5 and 9 centre tanks; TC Nos. 10 and 11 centre tanks'.

LR III.3.4 Other notations, as appropriate to the arrangements, scantlings and service, may be assigned.

LR III.4 Cargoes to be carried

LR III.4.1 Except where the Rule requirements have been limited as provided for in LR 1.1(d), there will be no objection to the carriage of oil cargoes in ships built in accordance with these Rules, provided the arrangements, scantlings and materials have been approved for this purpose and that compatibility with tank coatings is ensured, see LR 6.3(l).

Classification and Class Notations

Chapter LR III

Section 4

LR III.4.2 Proposals for the carriage of additional cargoes on classed chemical tankers, the keels of which were laid before 1st July 1986 having the Type Notations 'Chemical tanker Type A', 'Chemical tanker Type B', 'Chemical tanker Type C' or the Cargo Notations 'Cargo Type A', 'Cargo Type B', or 'Cargo Type C' will be considered on the basis of the containment provisions of the IMO Code for the *Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* (BCH Code). Cargoes which are required by the BCH Code to be carried on Type 1 or Type 2 ships will be considered as LR Type A cargoes for classification purposes. Cargoes which are permitted by the BCH Code to be carried on Type 3 ships will be considered as LR Type B cargoes for classification purposes, except that cargoes which additionally require containment separation from the ship's shell plating due, for example, to water reactivity or to the necessity for special materials of cargo tank construction, will be considered as LR Type A.

Information and Plans to be Submitted

Chapter LR IV

Section 1

LR IV.1 In addition to the plans required by the relevant Chapters of the Rules for Ships, the following information and plans are to be submitted:

- (a) Information:
- (i) The 'LR Chemship Questionnaire' is to be submitted.
 - (ii) In addition, for cargo tanks manufactured from stainless steel plate or carbon steel plate clad with stainless steel, the surface finish specification, fabrication procedures and permitted repairs are to be submitted to LR at the earliest opportunity, *see also* LR 6.2(j).
 - (iii) Particulars and capacities of ventilation arrangements for spaces referred to in Chapter 12 and any other spaces in which hazardous vapours may collect by virtue of the arrangement of openings.
 - (iv) Particulars of any special materials of construction.
 - (v) Particulars of any special containment features (e.g., pressure tanks).
 - (vi) The maximum contemplated cargo relative density and intended pressure/vacuum relief valve settings are to be indicated on the submitted midship section.
 - (vii) Details verifying compliance with the sizing of vent systems required by 8.2.4.
 - (viii) Particulars and arrangements of cargo tank gas-freeing systems.
 - (ix) Particulars of access, evacuation and rescue arrangements required by 3.3 and 3.4.
- (b) Plans:
- Ship general arrangement giving location of:
- (i) Hatches, tank cleaning and other openings within the cargo area.
 - (ii) Doors, hatches and other openings (e.g., vents) to cargo pump rooms, cargo service spaces, cofferdams, hold spaces containing independent tanks and void spaces.
 - (iii) Doors, hatches and other openings (e.g., vents and opening windows) to accommodation, pump rooms, control stations, machinery spaces and service spaces.
 - (iv) Independent tanks, lined or coated tanks, and tanks constructed of special materials.

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Structural Arrangements and Scantlings

Chapter LR V

Sections 1 & 2

LR V.1 General

LR V.1.1 Application

LR V.1.1.1 The requirements of Pt 4, Ch 9* or Pt 4, Ch 10* of the Rules for Ships as applicable are to be applied to chemical tankers, except as required by the provisions of this Chapter. Particular attention is drawn to the minimum thickness requirements of Pt 4, Ch 9, 10.2*.

LR V.1.1.2 References marked * refer to the Rules for Ships.

LR V.1.2 General definitions and symbols

LR V.1.2.1 The following symbols, used in these Rules, are fully defined in Pt 3, Ch 1, 6*:

- L = length of ship, in metres
- B = moulded breadth of ship, in metres
- D = moulded depth of ship, in metres
- T = moulded draught of ship, in metres.

LR V.1.2.2 The following symbols are also used in these Rules. Where these symbols are used in a different or more limited sense, with or without a distinguishing subscript, the amended definition is given at the head of the Section concerned:

- h = the load height applied to the item under consideration, in metres
- I = the moment of inertia, in cm^4 , of a primary or secondary member in association with an effective width of attached plating, determined in accordance with Pt 3, Ch 3, 3*
- L_1 = length of ship, in metres, but need not be taken greater than 190 m
- p_v = pressure/vacuum relief valve positive setting, not to be taken less than 0,2 bar gauge
- S = span, in metres, of the primary or secondary member measured between effective span points. For the determination of span points, see Pt 3, Ch 3, 3*
- s = spacing of secondary members, in mm
- t = thickness of plating, in mm
- z = the section modulus, in cm^3 , of the primary or secondary member, in association with an effective width of attached plating determined in accordance with Pt 3, Ch 3, 3*
- Z_B = actual hull section modulus at the keel, in cm^3 , as determined in accordance with Pt 3, Ch 3, 3, 4*
- Z_R = Rule hull section modulus, in cm^3 , as determined from Pt 3, Ch 4, 5, 5*
- ρ = relative density of cargo, but not to be taken less than 1,025.

LR V.1.2.3 The expression 'primary member' as used in this Chapter is defined as a girder, transverse, vertical web, stringer, cross tie, buttress or double bottom floor. 'Secondary members' are supporting members other than primary members.

LR V.2 Materials

LR V.2.1 General

LR V.2.1.1 Materials are to comply with Pt 3, Ch 2*.

LR V.2.1.2 Attention is also drawn to Chapter 6 of these Rules.

LR V.2.1.3 The following symbols and definitions are applicable to these Rules:

k_L, k = higher tensile steel factor. For the determination of this factor, see Pt 3, Ch 2, 1*
For mild steel k_L, k may be taken as 1,0.

See Ch 2, 2.2 of the Rules for Materials for definition of yield stress for steel.

LR V.2.2 Austenitic and duplex stainless steel

LR V.2.2.1 The following symbols and definitions are applicable to these Rules:

$$k_1 = \frac{235}{\sigma_{0RT}} \quad \left(k_1 = \frac{24}{\sigma_{0RT}} \right)$$

$$k_2 = \frac{235}{\sigma_{0T}} \quad \left(k_2 = \frac{24}{\sigma_{0T}} \right)$$

σ_{0RT} = specified minimum yield or 0,2 per cent proof stress, in N/mm^2 , at room temperature as specified in Table 3.7.2 in Ch 3, 7 of the Rules for Materials

σ_{0T} = specified minimum yield or 0,2 per cent proof stress, in N/mm^2 , at the design temperature; this can be taken as
 $= -40I_n(T) + 127 + \sigma_{0RT}$ for austenitic stainless steel without N grade designation
 $= -48I_n(T) + 142 + \sigma_{0RT}$ for austenitic stainless steel with N grade designation
 $= -65I_n(T) + 200 + \sigma_{0RT}$ for duplex stainless steel
 T = design temperature in $^{\circ}\text{C}$.

LR V.2.2.2 Alternative to the specified minimum 0,2 per cent proof stress at room temperature stipulated in Table 3.7.2 in Ch 3, 7 of the Rules for Materials, the manufacturer's specification can be used. The mechanical properties at room temperature specified in the plate manufacturer's specification are to be regarded as the minimum values for acceptance purposes and are to be included on all construction plans. The properties at the design temperature are also to be shown on the plans.

LR V.2.2.3 The formulas given in LR V.2.2.1 for calculating σ_{0T} are valid for temperatures from 20°C to 200°C . For applications at higher temperatures, special consideration is required.

LR V.2.2.4 Where duplex steel grades are to be used in areas which are subject to fatigue loading the material factors as calculated above k_1 and k_2 are not to be less than 0,66.

Structural Arrangements and Scantlings

Chapter LR V

Sections 2 to 5

LR V.2.3 Clad plates

LR V.2.3.1 For clad plates the specified minimum value of tensile strength or yield strength or 0,2 per cent proof stress can be calculated as:

$$\sigma_{\text{CLAD}} = \frac{t_1 \sigma_{01} + t_2 \sigma_{02}}{t_1 + t_2}$$

where

- t_1 = thickness of base material, in mm
- t_2 = thickness of cladding, in mm
- σ_{01} = specified minimum yield or 0,2 per cent proof stress of base material, in N/mm²
- σ_{02} = specified minimum yield or 0,2 per cent proof stress of base cladding, in N/mm².

LR V.3 Longitudinal strength

LR V.3.1 General

LR V.3.1.1 The longitudinal strength standard is to comply with the relevant requirements of Pt 3, Ch 4*.

LR V.3.2 Symbols

LR V.3.2.1 Symbols are defined in LR V.1.2.

LR V.3.3 Loading conditions

LR V.3.3.1 The range of loading conditions examined for longitudinal strength is to be fully representative of the cargo and ballast loading patterns which will occur in service, taking account of the relative densities of intended cargoes and also cargo segregation requirements, which may result in partial filling or non-uniform loading. The range of conditions is not, however, to be less than as provided for in Pt 4, Ch 9,3.3*.

LR V.3.3.2 In order to guard against high stresses being imposed through an unsatisfactory cargo or ballast loading, an approved loading instrument is to be provided for determining suitable loading, in all instances where a non-uniform load distribution may occur in service, as required by Pt 3, Ch 4,8.3*.

LR V.3.3.3 Where an approved loading instrument is provided, the conditions in the Loading Manual will be verified using the instrument, and the Manual will be endorsed to the effect that any departures from these conditions in service are also to be arranged on the basis of the loading instrument.

LR V.3.3.4 Attention is drawn to the remaining requirements of Pt 4, Ch 9,3.3*.

LR V.3.4 Hull section modulus

LR V.3.4.1 Where stainless steel, having a value of σ_1 or σ_2 less than 235 N/mm² (24 kgf/mm²), is incorporated in continuous longitudinal material in the vicinity of deck or bottom, the hull section modulus is to be not less than $Z_R k_1$, or $Z_R k_2$ respectively.

LR V.3.4.2 Where continuous upperdeck longitudinals or girders are fitted externally, the Rule hull modulus is to be attained at a point equivalent to the depth of longitudinal or girder above the moulded deck line at side.

LR V.3.5 Hull buckling strength

LR V.3.5.1 The buckling requirements of Pt 3, Ch 4,7* are to be satisfied where applicable. Where stainless steel is used the buckling requirements in Pt 3, Ch 4,7* are to be evaluated with the standard deduction for corrosion, $d_t = 0,5$ mm. For clad plates the standard deduction for corrosion is to be taken as $d_t = 0,5$ mm for the plate side with stainless steel.

LR V.4 Hull envelope plating

LR V.4.1 General

LR V.4.1.1 The requirements for hull envelope plating as given for oil tankers in Pt 4, Ch 9,4* are to be applied, except as provided for in this Section.

LR V.4.2 Side and bottom shell plating in way of cargo tanks

LR V.4.2.1 Additional calculations and re-inforcement may be required for side and bottom plating forming part of the boundary structure of a cargo tank which is intended for:

- (a) the carriage of cargoes having relative densities in excess of 1,025; or
- (b) pressure/vacuum relief valve settings which exceed a positive value of 0,20 bar gauge or a negative value of 0,07 bar gauge.

LR V.4.3 Deck plating in way of cargo tanks

LR V.4.3.1 Deck plating which forms part of the boundary structure of a cargo tank is to comply with the requirements of LR V.7, in addition to the relevant requirements of Pt 4, Ch 9,4*.

LR V.4.3.2 Where a stainless steel cargo tank boundary forms part of the upper deck, the minimum deck thickness given in Pt 4, Ch 9,4* may be reduced by the following amounts:

- (a) Solid stainless steel: 5 per cent or 1 mm, whichever is the greater.
- (b) Clad stainless steel: 5 per cent.

LR V.5 Hull framing

LR V.5.1 General

LR V.5.1.1 The framing requirements given for oil tankers in Pt 4, Ch 9,5* are to be applied, except as provided for in this Section.

Structural Arrangements and Scantlings

Chapter LR V

Sections 5 & 6

LR V.5.2 Side and bottom longitudinals in cargo tanks

LR V.5.2.1 Additional calculations and strengthening may be required for side and bottom longitudinals forming part of the boundary structure of cargo tanks which are intended for:

- (a) the carriage of cargoes having relative densities in excess of 1,025; or
- (b) pressure/vacuum relief valve settings which exceed a positive value of 0,2 bar gauge or a negative value of 0,07 bar gauge.

LR V.5.3 Deck longitudinals in way of cargo tanks

LR V.5.3.1 Deck longitudinals forming part of the boundary structure of cargo tanks are to comply with the requirements of LR V.7, in addition to the relevant requirements of Pt 4, Ch 9,5*.

LR V.5.3.2 Where upper deck longitudinals are fitted externally, arrangements are to be made to prevent tripping in way of transverse bulkheads. Continuity is to be maintained at the ends of the cargo tank region.

LR V.6 Double bottom construction

LR V.6.1 General

LR V.6.1.1 The requirements of this Section are to be considered additional to those of LR V.7 and Pt 4, Ch 8*.

LR V.6.1.2 The depth of the double bottom is to be not less than as required by 2.6 and is also to be not less than as required by Pt 4, Ch 8*. For high relative density cargoes, see also LR V.6.5 of this Section.

LR V.6.1.3 Due regard is to be paid to the depth of double bottom necessary to accommodate suitably sized access openings, and maintain the required standard of strength.

LR V.6.1.4 Arrangements are to be provided to enable double bottom tanks situated below cargo tanks to be filled with water ballast to assist in gas-freeing these tanks.

LR V.6.1.5 Side girders are to be arranged in way of longitudinal bulkheads.

LR V.6.1.6 Transverse continuity of inner bottom structure is to be maintained in way of longitudinal bulkheads. Where a double bottom is fitted in centre tanks only, the inner bottom is to be suitably scarphed into the wing tank structure.

LR V.6.2 Symbols

LR V.6.2.1 The symbols used in this Section are defined as follows:

- h = vertical distance from the mid-point of the span to the highest point of the tank, excluding the hatch-way, in metres
- S = span of longitudinals, in metres, measured between span points as shown in Pt 3, Ch 3,3*, but not to be taken less than 1,5 m.

LR V.6.2.2 Other symbols are defined in LR V.1.2.

LR V.6.3 Inner bottom longitudinals

LR V.6.3.1 The section modulus of inner bottom longitudinals in ships fitted with double bottoms under the cargo tanks is to be not less than the greater of the following:

- (a) Pt 4, Ch 9,6*.
- (b) $Z = 0,0081k s S^2 (\rho (h + 0,9) + 10 (\rho_V - 0,2)) \text{ cm}^3$.

LR V.6.4 Struts

LR V.6.4.1 Where struts are fitted, their scantlings are to be not less than as required by Pt 4, Ch 1,8.5*. In addition, the axial stress in the strut and the shear stress in lapped end connections are not to exceed 108 N/mm² (11,0 kgf/mm²) and 83,5 N/mm² (8,5 kgf/mm²) respectively.

LR V.6.5 High relative density cargoes

LR V.6.5.1 Where cargoes of relative density in excess of 1,025 are to be carried, the height of the double bottom may be required to be increased and, in addition, the floor scantlings and associated arrangements are to comply with the requirements of this sub-Section.

LR V.6.5.2 The shear stress in double bottom floors, using net area in way of openings, is not to exceed 83,5 N/mm² (8,5 kgf/mm²) in association with the greater of the two following loading standards:

- (a) Empty cargo tank with draught to deck edge.
- (b) Full cargo tank taking account of cargo relative density with draught = $\frac{T}{2}$ or $\left(T - \frac{L}{40}\right)$, whichever is the lesser.

LR V.6.5.3 Where floor stiffeners are lapped to bottom and inner bottom longitudinals, a shear stress of 83,5 N/mm² (8,5 kgf/mm²) is not to be exceeded in the welded connection. Where the floor stiffeners are directly welded to bottom and inner bottom longitudinals, an axial stress of 108 N/mm² (11,0 kgf/mm²) is not to be exceeded, except where approved deep penetration welding is used, in which case the axial stress is not to exceed 147 N/mm² (15,0 kgf/mm²). For the purpose of this calculation, the following two loading standards are to be applied:

- (a) Bottom longitudinal connections, draught to deck edge.
- (b) Inner bottom longitudinal connections, full cargo tank, taking account of cargo relative density.

LR V.6.5.4 Where collars or lugs are fitted the proportion of loading taken by the floor stiffener will be considered on the basis of the design of the connection and the requirements of Pt 3, Ch 10,5.2*.

LR V.6.5.5 Openings are not to be cut in double bottom floor panels adjacent to longitudinal bulkheads. Within a distance of 25 per cent of the floor span measured from supports, the edges of floor openings are to be re-inforced. Where the ratio of floor depth to floor thickness exceeds 100, the buckling strength of floor panels is to be verified by direct calculation.

Structural Arrangements and Scantlings

Chapter LR V

Sections 6 & 7

LR V.6.5.6 Double bottom construction involving the use of struts is not, in general, to be adopted where the cargo relative density exceeds 1,5. Where struts are proposed for cargoes having relative densities greater than 1,025, consideration will be required to be given to the strut and longitudinal scantlings, and the strut end connections may be required to be bracketed.

LR V.7 Cargo tank boundaries

LR V.7.1 General

LR V.7.1.1 The requirements of this Section are related to the application of mild steel, solid stainless steel or stainless clad steel. Thicknesses derived for clad steel include the cladding. The thickness of the cladding itself is to be at least 1,5 mm at the tank sides and top, and 2,0 mm at the tank bottom.

LR V.7.1.2 In no case may tanks integral with the hull structure be used for a pressure/vacuum relief valve setting exceeding 0,7 bar gauge. The negative setting is assumed not to exceed 0,07 bar gauge.

LR V.7.1.3 Scantlings are to be suitable for the relative densities of the cargoes intended to be carried.

LR V.7.1.4 Where it is proposed to carry cargoes requiring temperature control for reasons of safe carriage, the temperature control arrangements are to be appropriate to the intended service and the characteristics of the cargo. Details are to be submitted.

LR V.7.1.5 Tank boundary scantlings are to be not less than the minimum standard required for oil tankers, i.e., as required by Pt 4, Ch 9*, without correction for relative density.

LR V.7.1.6 The ends of corrugated bulkheads are to be suitably supported, where necessary by fitting additional stiffening.

LR V.7.2 Symbols

LR V.7.2.1 The symbols used in this Section are defined as follows:

$$f = 1,1 - \frac{s}{2500l} \text{ but need not exceed } 1,0$$

h_1, h_2, h_3 are vertical distances, in metres, from a point one-third of the height of the plate above its lowest edge to:

for h_1 the highest point of the tank, excluding the hatch-way

for h_2 the top of the overflow

for h_3 the level of test head defined in Pt 3, Ch 1,8*

h_4, h_5, h_6 are vertical distances, in metres, from the mid-point of the stiffener length, l_e , to:

for h_4 the highest point of the tank, excluding the hatch-way

for h_5 the top of the overflow

for h_6 the level of test head defined in Pt 3, Ch 1,8*

K_c = plate thickness factor, in mm, see LR V.7.4

l = overall length of stiffener between the support points, in metres

l_e = effective length of stiffener, in metres, as defined in Table 1.9.1 of Pt 4, Ch 1*

p = pitch of symmetrical corrugations, in mm

s = stiffener spacing for plane and double plate bulkheads, in mm, or

= breadth of flange or web, whichever is the greater, for corrugated bulkheads, in mm

α_p = α_1, α_2 or α_3 , whichever is the greatest

where

$$\alpha_1 = \frac{p h_1}{1,025} + 10 (p_v - 0,2)$$

$$\alpha_2 = \frac{p h_2}{2,05}$$

$$\alpha_3 = \frac{h_3}{1,95}$$

α_s = α_4, α_5 or α_6 , whichever is the greatest,

where

$$\alpha_4 = \frac{p h_4}{1,025} + 10 (p_v - 0,2)$$

$$\alpha_5 = \frac{p h_5}{2,05}$$

$$\alpha_6 = \frac{h_6}{1,95}$$

γ = 1,4 for rolled or built sections and double plate bulkheads

= 1,6 for flat bars

= 1,1 for symmetrical corrugations

ω_1, ω_2 = end constraint factors, values given in Table 1.9.3 of Pt 4, Ch 1*.

LR V.7.2.2 Other symbols are defined in LR V.1.2.

LR V.7.3 Minimum thickness for stainless steel

LR V.7.3.1 Where stainless steel is used, the minimum thickness in cargo tanks required by Pt 4, Ch 9, 10.2* may be reduced by $(2,5 - K_c)$ mm, or is to be increased if K_c is greater than 2,5 mm. The final overall thickness of material is to be not less than 6,5 mm for tops and sides, and 7 mm for the bottoms, of tanks. See also LR V.7.1.1 for minimum thickness of cladding.

LR V.7.4 Plating

LR V.7.4.1 The thickness of plating forming boundaries of cargo tanks is to be not less than given below, but may be required to be increased locally on account of high shear forces, in accordance with Pt 3, Ch 4,6*:

$$t = 0,004sf \sqrt{k \alpha_p} + K_c \text{ mm}$$

LR V.7.4.2 For mild steel construction, the value of the plate thickness factor, K_c , is 2,5 mm. For stainless steel, K_c depends upon the type of material and its position, as represented by the designation of the adjacent space. See Table LR V.7.1.

Structural Arrangements and Scantlings

Chapter LR V

Sections 7 & 8

Table LR V.7.1 Values of plate thickness factor, K_c for solid and clad stainless steel

Item	Designation of space adjacent to cargo tank having stainless steel boundaries	K_c , in mm	
		Solid	Clad
1	Cargo tank	2	2,25
2	Dry space	1	1,5
3	Weather deck	1	1,5
4	Water ballast deep tank	See LR 6.3(j)	2
5	Water ballast deep tank (coated)	1	1,5
6	Double bottom ballast tank	See LR 6.3(j)	2,5
7	Double bottom ballast tank (coated)	1,5	2
8	Double bottom dry tank	1,5	2
9	Integral heating duct	2	3

LR V.7.5 Stiffeners and corrugations

LR V.7.5.1 The section modulus of rolled or fabricated stiffeners and double plate bulkhead supports is to be not less than:

$$Z = \frac{k s \alpha_s l_e^2}{22\gamma (w_1 + w_2 + 2)} \text{ cm}^3.$$

LR V.7.5.2 The inertia of rolled or fabricated stiffeners is to be not less than:

$$I = \frac{2,3}{k} l_e Z \text{ cm}^4.$$

LR V.7.5.3 For symmetrical corrugations, the section modulus is to be not less than:

$$Z = \frac{k p \alpha_s l_e^2}{22\gamma (w_1 + w_2 + 2)} \text{ cm}^3.$$

LR V.7.5.4 The remaining requirements of Pt 4, Ch 9,6* or Pt 4, Ch 9,7* as applicable in respect of the proportions of stiffening members and corrugations are also to be fulfilled.

LR V.7.5.5 Where stainless steel is employed, the plating thickness calculated for corrugated bulkheads in accordance with LR V.7.5.3 may be reduced by $(2,5 - K_c)$ mm.

LR V.7.5.6 The section modulus of mild steel stiffeners attached to solid or clad stainless steel plating is to be based on the actual plating thickness.

LR V.7.5.7 Where solid stainless steel stiffeners are to be fitted, the thickness may be as required for mild steel, reduced by 0,5 mm.

LR V.7.5.8 Where σ_1 or σ_2 is less than 235 N/mm² (24 kgf/mm²), scantlings are to be increased by substituting the corresponding value of k_1 or k_2 for k in tank boundary formulae for stiffener modulus and plating thickness. The value of k_1 or k_2 is not, however, to be used to reduce Rule inertia or plate thickness requirements as given, for example, in LR V.7.5.2 and item 1(b) in Table 9.7.1 of Pt 4, Ch 9* respectively.

LR V.7.6 Welding

LR V.7.6.1 Weld factors as given in Pt 3, Ch 10*, Table 10.2.1 item (7) for Chemical Tankers are to be applied in conjunction with item (6) for Tankers of this Table.

LR V.8 Primary structure**LR V.8.1 General**

LR V.8.1.1 Direct calculation procedures are to be adopted where required by Pt 4, Ch 9*. Additional calculations may be required where these are justified by the intended design or loading conditions, for example:

- Where double-skin construction is contemplated in association with large openings in wing cofferdams.
- Where Rule primary member scantlings and arrangements designed for transverse strength purposes on the basis of Pt 4, Ch 9* are proposed for: the carriage of cargoes having relative densities in excess of 1,025, or pressure/vacuum relief valve settings which exceed a positive value of 0,2 bar gauge or a negative value of 0,07 bar gauge. See also LR V.7.1.2.

LR V.8.2 External deck transverses

LR V.8.2.1 Where deck transverses are fitted externally in way of the centre cargo tanks, the former are to be aligned with the internal deck transverses in wing tanks. The external transverses are to extend outboard of the longitudinal bulkheads to ensure continuity of structure and a satisfactory degree of end fixity. The outboard ends of the external transverses are to be tapered in the form of brackets, and slots in internal primary structure are to be collared in way.

LR V.8.2.2 Web stiffening and lateral support arrangements are to comply with Pt 4, Ch 9,10* and are to include tripping brackets in line with longitudinal bulkheads. Tripping brackets fitted in way of wing tanks are to be supported by suitable underdeck structure.

LR V.8.2.3 Where continuous upperdeck girders are fitted externally, structural continuity is to be maintained.

LR V.8.2.4 External deck transverses and girders are in general to comply with cargo tank minimum thickness requirements.

Structural Arrangements and Scantlings

Chapter LR V

Sections 9 & 10

LR V.9 Direct calculations

LR V.9.1 General

LR V.9.1.1 Attention is drawn to LR's *ShipRight Structural Design Assessment procedure, Direct calculations – Guidance notes, Primary structure of tankers*.

LR V.9.2 Design loads

LR V.9.2.1 Where direct calculations are required, account is to be taken of cargo relative densities in excess of 1,025 (see also LR V.6.5.2 and LR V.6.5.3), associated test heads (see Pt 3, Ch 1*) and pressure/vacuum relief valve settings which exceed positive or negative values of 0,2 bar gauge and 0,07 bar gauge respectively. See also LR V.7.1.2.

LR V.10 Heated cargoes

LR V.10.1 General

LR V.10.1.1 In order to facilitate assessment of the seagoing operating temperatures of cargo tank structure, a temperature distribution investigation is to be submitted when:

- (a) the cargo heating source is integral with the structure of cargo tank boundaries which are not in contact with the sea, or
- (b) heated cargoes are to be carried in longitudinally framed ships at temperatures exceeding 65°C in integral tanks. Consideration will be given to permissible temperatures for ships with partial transverse framing, taking account of the submitted structural arrangements.

LR V.10.1.2 If the steel temperature exceeds the values given above, calculations giving resultant stresses on the hull structure, based on a sea temperature of 0°C and an air temperature of 5°C, are to be submitted, together with proposals for necessary reinforcement of the hull structure and/or limitation of the still water bending moment for heated cargo conditions.

LR V.10.1.3 Submitted proposals are to take account of non-uniform loading patterns with resultant variations in temperature distribution, where appropriate.

LR V.10.1.4 Provided that the heat source is not adjacent to the hull structure, cargo temperatures of up to 80°C will be accepted without temperature and thermal stress calculations, in cases where transverse framing is adopted for longitudinal bulkhead and side shell, and the integral cargo tanks have common boundaries with the sea.

LR V.10.1.5 For bituminous cargoes which form a mastic layer on cargo tank boundaries, acceptance of higher temperatures in integral centre tanks of single bottom tankers without thermal stress investigation will be considered provided the appropriate requirements of MARPOL 73/78 Annex I are complied with.

LR V.10.1.6 Where molten cargoes are to be carried at temperatures which may result in excessive condensation in spaces adjacent to cargo tanks, consideration will be given, in appraisal, to the possibility of increased corrosion and the need for additional protection.

LR V.10.2 Application of stainless steel

LR V.10.2.1 Where integral stainless steel tanks are to be used for heated cargoes, and the conditions specified in LR V.10.1.1(a) or (b) apply, account is to be taken of the operating steel temperature. Where σ_2 is less than 235 N/mm² (24 kgf/mm²), scantlings are to be increased by substituting the corresponding value of k_2 for k in the cargo tank boundary formulae for stiffener and plating thickness. The value of k_2 is not, however, to be used to reduce Rule inertia or plate thickness requirements. Also, the hull section modulus is to be not less than $Z_R k_2$ where stainless steel is incorporated in continuous longitudinal material in the vicinity of deck or bottom.

LR V.10.2.2 Where clad steel is fitted, k_2 is to be calculated on the basis of the yield stress or 0,2 per cent proof stress of the stainless steel cladding at the operating temperature.

LR V.10.3 Heating ducts

LR V.10.3.1 Where heating ducts are integral with the tank structure, they are to be designed to withstand a head equal to the maximum pressure in the heating system, but in no case less than that imposed by the highest cargo load for which the tanks have been designed.

LR V.10.3.2 For other aspects of cargo heating, see Pt 5, Ch 15,6*.

Cargo Tank Inerting Arrangements

Chapter LR VI

Sections 1 & 2

LR VI.1 Inert Gas Systems

LR VI.1.1 The following requirements apply where an inert gas system based on oil fired inert gas generators is fitted on board chemical tankers.

LR VI.1.2 The inert gas system is to comply with the requirements of Resolution A.567(14). For the purposes of classification any use of the word 'Administration' in the Resolution is to be taken as meaning LR, see LR II.3.

LR VI.1.3 As an alternative to the water seal in the inert gas line on deck, an arrangement consisting of two shut-off valves in series with a venting valve in between (double block and bleed) enabling the shut-off valves to close and the vent valve to open, and vice versa, may be accepted. The following conditions apply:

- (a) The operation of the valve is to be automatically executed. Signal(s) for opening/closing is (are) to be taken from the process directly, e.g., inert gas flow or differential pressure.
- (b) Alarm for faulty operation of the valves is to be provided, e.g., the operation status of 'blower stop' and 'shut-off valve(s) open' is an alarm condition.

LR VI.1.4 In addition to the requirements detailed in Resolution A.567(14), the following requirements for inert gas systems are to be complied with:

- (a) When two blowers are provided, the total required capacity of the inert gas system is preferably to be divided equally between the two blowers, and in no case is one blower to have a capacity less than 1/3 of the total capacity required.
- (b) Those parts of scrubbers, blowers, non-return devices, scrubber effluent and other drain pipes which may be subjected to corrosive action by the gases and/or liquids, are to be either constructed of corrosion resistant material or lined with rubber, glass fibre epoxy resin or other equivalent coating material.
- (c) The compartment in which any oil fired inert gas generator is situated is to be treated as a machinery space of Category A with respect to fire protection.

LR VI.2 Nitrogen Generator Systems

LR VI.2.1 The following requirements are specific only to the gas generator system and apply where inert gas is produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.

LR VI.2.2 Where nitrogen generator systems are provided in place of boiler flue gas or oil fired inert gas generators referred to in LR VI.1, the following requirements of Chapter 15 of the FSS Code or equivalent requirements of Resolution A.567(14) remain applicable for the piping arrangements, alarms and instrumentation downstream of the gas generator: 2.3.1.3.1, 2.3.1.3.2, 2.3.1.5, 2.3.2, 2.4.2, 2.4.3.1.6, 2.4.3.1.8, 2.4.3.1.9, 2.4.3.3, 2.4.3.4, 2.4.4, as well as SOLAS Reg.II-2/4.5.3.4.2, 4.5.6.3 and 11.6.3.4.

LR VI.2.3 A nitrogen generator consisting of a feed air treatment system and any number of membrane or adsorber modules in parallel is to be capable of delivering nitrogen to the cargo tanks at a rate of at least 125 per cent of the maximum discharge capacity of the ship expressed as a volume to time rate.

LR VI.2.4 The air compressor and the nitrogen generator may be installed in the engine room or in a separate compartment. A separate compartment is to be treated as one of 'other machinery spaces' with respect to fire protection.

LR VI.2.5 Where a separate compartment is provided, it is to be positioned outside the cargo area and is to be fitted with an independent mechanical extraction ventilation system providing at least 6 air changes per hour. The compartment is to have no direct access to accommodation spaces, service spaces and control stations and is to be provided with oxygen level detection equipment with a low oxygen level alarm.

LR VI.2.6 The nitrogen generator is to be capable of delivering high purity nitrogen with oxygen content not exceeding 5 per cent by volume. The system is to be fitted with automatic means to discharge gas to the atmosphere during start-up and abnormal operation when predetermined limits are reached, see LR VI.2.16(a) to (e).

LR VI.2.7 The system is to be provided with two air compressors. The total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required. A system with one air compressor only may be accepted provided that sufficient spares for the air compressor and its prime mover are carried on board to enable their failure to be rectified by the ship's crew.

LR VI.2.8 A feed air treatment system is to be fitted to remove free water, particles and traces of oil from the compressed air, and to maintain the specification temperature.

LR VI.2.9 Where a nitrogen receiver/buffer tank is required to be fitted it may be installed in a dedicated compartment or in the separate compartment containing the air compressor and the generator or may be located in the cargo area. Where the nitrogen receiver/buffer tank is installed in an enclosed space, the access is to be arranged from the open deck only and the access door is to open outwards. Permanent ventilation and alarm arrangements are to be fitted as required by LR VI.2.5.

Cargo Tank Inerting Arrangements

Chapter LR VI

Sections 2 & 3

LR VI.2.10 The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be arranged to discharge to a safe location on the open deck. This safe location needs to address the two types of discharges separately.

For oxygen-enriched air from the nitrogen generator, safe locations on the open deck are:

- outside of hazardous areas as defined by Pt 6, Ch 2, 13.5 of the Rules for Ships;
- not within 3 m of areas traversed by personnel;
- not within 6 m of air intakes for machinery and all ventilation inlets.

For nitrogen-product enriched gas from the protective devices of the nitrogen receiver, safe locations on the open deck are:

- not within 3 m of areas traversed by personnel;
- not within 6 m of air intakes for machinery and all ventilation inlets/outlets.

LR VI.2.11 In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.

LR VI.2.12 At least two non-return devices are to be fitted in the inert gas supply main, one of which is to be of the double block and bleed arrangement, see LR VI.1.3. The second non-return device is to be equipped with positive means of closure.

LR VI.2.13 Instrumentation is to be provided for continuously indicating the temperature and pressure of air:

- (a) at the discharge of the compressor,
- (b) at the inlet to the nitrogen generator.

LR VI.2.14 Instrumentation is to be fitted for continuously indicating and permanently recording the oxygen content of the inert gas downstream of the nitrogen generator when inert gas is being supplied.

LR VI.2.15 The instrumentation referred to in LR VI.2.14 is to be placed in the cargo control room where provided. Where no cargo control room is provided, the instrumentation is to be placed in a position easily accessible to the officer in charge of cargo operations.

LR VI.2.16 Audible and visual alarms are to be provided to indicate:

- (a) low feed-air pressure from compressor as referred to in LR VI.2.13(a),
- (b) high air temperature as referred to in LR VI.2.13(a),
- (c) high condensate level at automatic drain of water separator as referred to in LR VI.2.8,
- (d) failure of electrical heater, if fitted,
- (e) oxygen content in excess of that required in LR VI.2.6,
- (f) failure of power supply to the instrumentation as referred to in LR VI.2.14.

LR VI.2.17 Automatic shut-down of the system is to be arranged upon alarm conditions as required by LR VI.2.16(a) to (e).

LR VI.2.18 The alarms required by LR VI.2.16(a) to (f) are to be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.

LR VI.3 Nitrogen/inert gas systems fitted for purposes other than inerting required by SOLAS Reg. II-2/4.5.5.1.1

LR VI.3.1 The requirements of LR VI.2 apply except LR VI.2.1, LR VI.2.2, LR VI.2.3 and LR VI.2.7.

LR VI.3.2 Where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required by LR VI.2.12 may be substituted by two non-return valves.

Preamble

IBC CODE

1 The purpose of this Code is to provide an international standard for the safe carriage by sea in bulk of dangerous and noxious liquid chemicals listed in chapter 17 of the Code. The Code prescribes the design and construction standards of ships, regardless of tonnage, involved in such carriage and the equipment they shall carry so as to minimise the risk to the ship, to its crew and to the environment, having regard to the nature of the products involved.

2 The basic philosophy of the Code is to assign, to each chemical tanker, one of the ship types according to the degree of the hazards of the products carried by such ships. Each of the products may have one or more hazard properties, including flammability, toxicity, corrosivity and reactivity, as well as the hazard they may present to the environment.

3 Throughout the development of the Code it was recognised that it must be based upon sound naval architectural and engineering principles and the best understanding available as to the hazards of the various products covered. Furthermore, chemical tanker design technology is not only a complex technology but is rapidly evolving and therefore the Code should not remain static. Thus, the Organization will periodically review the Code, taking into account both experience and technical developments.

4 Amendments to the Code involving requirements for new products and their conditions of carriage will be circulated as recommendations, on an interim basis, when adopted by the Maritime Safety Committee (MSC) and the Marine Environment Protection Committee (MEPC) of the Organization, in accordance with the provisions of article VIII of the International Convention for the Safety of Life at Sea, 1974 (SOLAS 74), and article 16 of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), respectively, pending the entry into force of these amendments.

5 The Code primarily deals with ship design and equipment. In order to ensure the safe transport of the products, the total system must, however, be appraised. Other important facets of the safe transport of the products, such as training, operation, traffic control and handling in port, are being or will be, examined further by the Organization.

6 The development of the Code has been greatly assisted by a number of organisations in consultative status such as the Association of Classification Societies (IACS) and of the International Electrotechnical Commission (IEC).

7 Chapter 16 of the Code, dealing with operational requirements of chemical tankers, highlights the regulations in other chapters that are operational in nature and mentions those other important safety features that are peculiar to chemical tanker operation.

8 The layout of the Code is in line with the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), adopted by the Maritime Safety Committee at its forty-eighth session. Gas carriers may also carry in bulk liquid chemicals covered by this Code, as prescribed in the IGC Code.

9 The 1998 edition of the Code was based on the original text as adopted by MSC resolution MSC.4(48). In response to resolution 15 of the International Conference on Marine Pollution, 1973, the MEPC, at its twenty-second session, adopted, by resolution MEPC.19(22), the IBC Code extended to cover marine pollution prevention aspects for the implementation of Annex II to MARPOL 73/78.

10 This edition of the Code includes amendments adopted by the following resolutions:

Resolution	Adoption	Deemed acceptance	Entry into force
1 MSC.10(54)	29 April 1987	29 April 1988	30 October 1988
2 MSC.14(57) MEPC.32(27)	11 April 1989 17 March 1989	12 April 1990 12 April 1990	13 October 1990 13 October 1990
3 MSC.28(61) MEPC.55(33)	11 December 1992 30 October 1992	1 January 1994 1 January 1994	1 July 1994 1 July 1994
4 MSC.50(66) MEPC.69(38)	4 June 1996 10 July 1996	1 January 1998 1 January 1998	1 July 1998 1 July 1998
5 MSC.58(67) MEPC.73(39)	5 December 1996 10 March 1997	1 January 1998 10 January 1998	1 July 1998 10 July 1998*
6 MSC.102(73)	5 December 2000	1 January 2002	1 July 2002
7 MSC.176(79) MEPC.119(52)	9 December 2004 15 October 2004	1 July 2006 1 July 2006	1 January 2007 1 January 2007
8 MSC.219(82) MEPC.166(56)	8 December 2006 13 July 2007	1 July 2008 1 July 2008	1 January 2009 1 January 2009

Preamble

IBC CODE

11 As from the date of entry into force of the 1983 amendments to SOLAS 74 (i.e. 1 July 1986) and the date of implementation of Annex II of MARPOL 73/78 (i.e. 6 April 1987), this Code became subject to mandatory requirements under these Conventions. Amendments to the Code, whether from the point of view of safety or of marine pollution, must therefore be adopted and brought into force in accordance with the procedures set down in article VIII of SOLAS 74 and article 16 of MARPOL 73/78 respectively.

General

Chapter 1

Sections 1 & 2

1.1 Application

1.1.1 The Code applies to ships regardless of size, including those of less than 500 gross tonnage, engaged in the carriage of bulk cargoes of dangerous chemicals or noxious liquid substances (NLS), other than petroleum or similar flammable products as follows:

- .1 products having significant fire hazards in excess of those of petroleum products and similar flammable products;
- .2 products having significant hazards in addition to or other than flammability.

1.1.2 Products that have been reviewed and determined not to present safety and pollution hazards to such an extent as to warrant the application of the Code are found in chapter 18.

1.1.3 Liquids covered by the Code are those having a vapour pressure not exceeding 0.28 MPa absolute at a temperature of 37.8°C.

1.1.4 For the purpose of the 1974 SOLAS Convention, the Code applies to ships which are engaged in the carriage of products included in chapter 17 on the basis of their safety characteristics and identified as such by an entry of S or S/P only in *column d*.

1.1.5 For the purposes of MARPOL 73/78, the Code applies only to NLS tankers, as defined in regulation 1.16.2 of Annex II thereof, which are engaged in the carriage of Noxious Liquid Substances identified as such by an entry of "X", "Y" or "Z" in *column c* of chapter 17.

1.1.6 For a product proposed for carriage in bulk, but not listed in chapters 17 or 18, the Administration and port Administrations involved in such carriage shall prescribe the preliminary suitable conditions for the carriage, having regard to the criteria for hazard evaluation of bulk chemicals. For the evaluation of the pollution hazard of such a product and assignment of its pollution category, the procedure specified in regulation 6.3 of Annex II of MARPOL 73/78 must be followed. The Organization shall be notified of the conditions for consideration for inclusion of the product in the Code.

1.1.7 Unless expressly provided otherwise, the Code applies to ships, the keels of which are laid or which are at the stage where:

- .1 construction identifiable with the ship begins; and
- .2 assembly has commenced comprising at least 50 tonnes or 1% of the estimated mass of all structural material, whichever is less;

on or after 1 July 1986.

LR 1.1(a) For classification purposes these Rules may, but need not be, applied to ships for which the midship section is approved prior to 1 July 1986.

1.1.8 A ship, irrespective of the date of construction, which is converted to a chemical tanker on or after 1 July 1986, shall be treated as a chemical tanker constructed on the date on which such conversion commences. This conversion provision does not apply to the modification of a ship referred to in regulation 1.14 of Annex II of MARPOL 73/78.

1.1.9 Where reference is made in the Code to a paragraph, all the provisions of the subparagraphs of that designation shall apply.

LR 1.1(b) For classification purposes these Rules apply to the arrangements and scantlings of sea-going tankers intended for the carriage of bulk liquid cargoes included in Chapter 17 and also cover the carriage of cargoes listed in Chapter 18. The requirements of LR's Rules for Ships, including Pt 4, Ch 9, are also to be complied with as appropriate to the contemplated class notation and cargoes.

LR 1.1(c) The requirements contained in these Rules apply to chemical tankers having single or double bottom, single or double skin, with or without deck cofferdam, also separate or independent tanks as appropriate to ship type and to cargo containment requirements.

LR 1.1(d) Where a ship is designed to carry a limited number of specific cargoes, consideration will be given for classification purposes to application of Rule requirements as appropriate to the particular hazards involved.

LR 1.1(e) The classification content of these Rules does not cover the inter-compatibility aspects of chemical cargoes. The arrangements of tanks and associated systems are, however, to be such as will permit the handling and simultaneous carriage of different liquid cargoes except as provided for in LR 1.1(d). Arrangements for conserving the quality of the cargo are the responsibility of the Owner.

LR 1.1(f) For ships intended for the carriage of liquefied petroleum or natural gases, see the Rules for Ships for Liquefied Gases.

1.2 Hazards

Hazards of products covered by the Code include:

1.2.1 *Fire hazard*, defined by flashpoint, explosive flammability limits/range and autoignition temperature of the chemical.

1.2.2 *Health hazard*, defined by:

- .1 corrosive effects on the skin in the liquid state; or
- .2 acute toxic effect, taking into account values of: LD₅₀ (oral): a dose, which is lethal to 50% of the test subjects when administered orally; LD₅₀ (dermal): a dose, which is lethal to 50% of the test subjects when administered to the skin; LC₅₀ (inhalation): the concentration which is lethal by inhalation to 50% of the test subjects; or
- .3 Other health effects such as carcinogenicity and sensitisation.

1.2.3 *Reactivity hazard*, defined by reactivity:

- .1 with water;
- .2 with air;
- .3 with other products; or
- .4 of the product itself (e.g. polymerisation).

General

Chapter 1

Sections 2 & 3

- 1.2.4 *Marine pollution hazard*, as defined by:
- .1 bioaccumulation;
 - .2 lack of ready biodegradability;
 - .3 acute toxicity to aquatic organisms;
 - .4 chronic toxicity of aquatic organisms;
 - .5 long term human health effects; and
 - .6 physical properties resulting in the product floating or sinking and so adversely affecting marine life.

1.3 Definitions

The following definitions apply unless expressly provided otherwise. (Additional definitions are given in individual chapters.)

1.3.1 *Accommodation spaces*, are those spaces used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobbies rooms, barber shops, pantries containing no cooking appliances and similar spaces. *Public spaces* are those portions of the accommodation spaces which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.

1.3.2 *Administration* means the Government of the State whose flag the ship is entitled to fly. For *Administration (Port)* see *Port Administration*.

1.3.3 *Anniversary date* means the day and the month of each year, which will correspond to the date of expiry of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

1.3.4 *Boiling point* is the temperature at which a product exhibits a vapour pressure equal to the atmospheric pressure.

1.3.5 *Breadth (B)* means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material. The breadth (B) shall be measured in metres.

LR 1.3(a) *The Bulk Chemical Code* is the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (Resolution MEPC 20(22) and Resolution MSC 9(53)).

1.3.6 *Cargo area* is that part of the ship that contains cargo tanks, slop tanks, cargo pump-rooms including pump-rooms, cofferdams, ballast or void spaces adjacent to cargo tanks or slop tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above-mentioned spaces. Where independent tanks are installed in hold spaces, cofferdams, ballast or void spaces at the after end of the aftermost hold space or at the forward end of the forward-most hold space are excluded from the cargo area.

LR 1.3(b) *Cargo control room or station* is a space used in the control of cargo handling operations.

1.3.7 *Cargo pump-room* is a space containing pumps and their accessories for the handling of the products covered by the Code.

1.3.8 *Cargo service spaces* are spaces within the cargo area used for workshops, lockers and store-rooms of more than 2 m² in area, used for cargo-handling equipment.

1.3.9 *Cargo tank* is the envelope designed to contain the cargo.

LR 1.3(c) *Certificate of Fitness* is the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk issued under the provisions of the IBC Code as amended.

1.3.10 *Chemical tanker* is a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in chapter 17.

1.3.11 *Cofferdam* is the isolating space between two adjacent steel bulkheads or decks. This space may be a void space or a ballast space.

1.3.12 *Control stations* are those spaces in which ship's radio or main navigating equipment or the emergency source of power is located or where the fire-recording or fire-control equipment is centralised. This does not include special fire-control equipment which can be most practically located in the cargo area.

1.3.13 *Dangerous chemicals* means any liquid chemicals designated as presenting a safety hazard, based on the safety criteria for assigning products to chapter 17.

1.3.14 *Density* is the ratio of the mass to the volume of a product, expressed in terms of kilograms per cubic metre. This applies to liquids, gases and vapours.

1.3.15 *Explosive/flammability limits/range* are the conditions defining the state of fuel-oxidant mixture at which application of an adequately strong external ignition source is only just capable of producing flammability in a given test apparatus.

1.3.16 *Flashpoint* is the temperature in degrees Celsius at which a product will give off enough flammable vapour to be ignited. Values given in the Code are those of "closed-cup test" determined by an approved flashpoint apparatus.

1.3.17 *Hold space* is the space enclosed by the ship's structure in which an independent cargo tank is situated.

LR 1.3(d) *The IBC Code* is the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, as amended.

1.3.18 *Independent* means that a piping or venting system, for example, is in no way connected to another system and that there are no provisions available for the potential connection to other systems.

1.3.19 *Length (L)* means 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel, the waterline on which this length is measured shall be parallel to the designed waterline. The length (L) shall be measured in metres.

General

Chapter 1

Sections 3 & 4

1.3.20 *Machinery spaces of category A* are those spaces and trunks to such spaces which contain:

- .1 internal-combustion machinery used for main propulsion; or
- .2 internal-combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or
- .3 any oil-fired boiler or oil fuel unit or oil fired equipment other than boilers, such as inert gas generators, incinerators etc.

1.3.21 *Machinery spaces* are all machinery spaces of category A and all other spaces containing propelling machinery, boilers, oil fuel units, steam and internal-combustion engines, generators and major electrical machinery, oil filling station, refrigerating, stabilising, ventilation and air-conditioning machinery, and similar spaces, and trunks to such spaces.

1.3.22 *MARPOL* means the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, as amended.

1.3.23 *Noxious Liquid Substance* means any substance indicated in the Pollution Category column of chapters 17 or 18 of the International Bulk Chemical Code, or the current MEPC.2/Circular or provisionally assessed under the provisions of regulation 6.3 of MARPOL Annex II as falling into categories X, Y or Z.

LR 1.3(e) *National Authority* is the Government of the State whose Flag the ship is entitled to fly.

1.3.24 *Oil fuel unit* is the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal-combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a gauge pressure of more than 0.18 MPa.

1.3.25 *Organization* is the International Maritime Organization (IMO).

1.3.26 *Permeability* of a space means the ratio of the volume within that space which is assumed to be occupied by water to the total volume of that space.

1.3.27 *Port administration* means the appropriate authority of the country in the port of which the ship is loading or unloading.

1.3.28 *Products* is the collective term used to cover both Noxious Liquid Substances and Dangerous Chemicals.

1.3.29 *Pump-room* is a space, located in the cargo area, containing pumps and their accessories for the handling of ballast and oil fuel.

1.3.30 *Recognised standards* are applicable international or national standards acceptable to the Administration or standards laid down and maintained by an organisation which complies with the standards adopted by the Organization and which is recognised by the Administration.

1.3.31 *Reference temperature* is the temperature at which the vapour pressure of the cargo corresponds to the set pressure of the pressure-relief valve.

LR 1.3(f) *Rules for Ships* are Lloyd's Register's *Rules and Regulations for the Classification of Ships* and *Rules for Materials* are Lloyd's Register's *Rules for the Manufacture, Testing and Certification of Materials*.

1.3.32 *Separate* means that a cargo piping system or cargo vent system, for example, is not connected to another cargo piping or cargo vent system.

1.3.33 *Service spaces* are those spaces used for galleys, pantries containing cooking appliances, lockers, mail and specie rooms, store-rooms, workshops other than those forming part of the machinery spaces and similar spaces and trunks to such spaces.

1.3.34 *SOLAS* means the International Convention for the Safety of Life at Sea, 1974, as amended.

LR 1.3(g) *Statement of Compliance* is a statement issued in respect of eligible ships to the effect that as far as LR is concerned, the vessel complies with the requirements of the IBC Code, or the Bulk Chemical Code.

1.3.35 *Vapour pressure* is the equilibrium pressure of the saturated vapour above a liquid expressed in Pascals (Pa) at a specified temperature.

1.3.36 *Void space* is an enclosed space in the cargo area external to a cargo tank, other than a hold space, ballast space, oil fuel tank, cargo pump-room, pump-room, or any space in normal use by personnel.

1.4 Equivalents

1.4.1 Where the Code requires that a particular fitting, material, appliance, apparatus, item of equipment or type thereof shall be fitted or carried in a ship, or that any particular provision shall be made, or any procedure or arrangement shall be complied with, the Administration may allow any other fitting, material, appliance, apparatus, item of equipment or type thereof to be fitted or carried, or any other provision, procedure or arrangement to be made in that ship, if it is satisfied by trial thereof or otherwise that such fitting, material, appliance, apparatus, item of equipment or type thereof or that any particular provision, procedure or arrangement is at least as effective as that required by the Code. However, the Administration may not allow operational methods or procedures to be made an alternative to a particular fitting, material, appliance, apparatus, item of equipment, or type thereof, which are prescribed by the Code, unless such substitution is specifically allowed by the Code.

1.4.2 When the Administration allows any fitting, material, appliance, apparatus, item of equipment, or type thereof, or provision, procedure, or arrangement, or novel design or application to be substituted, it shall communicate to the Organization the particulars thereof, together with a report on the evidence submitted, so that the Organization may circulate the same to other Contracting Governments to SOLAS and Parties to MARPOL for the information of their officers.

General

Chapter 1

Section 5

1.5 Surveys and certification

1.5.1 Survey procedure

1.5.1.1 The survey of ships, so far as regards the enforcement of the provisions of the regulations and granting of exemptions therefrom, shall be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organisations recognised by it.

1.5.1.2 The recognised organisation, referred to in regulation 8.2.1 of MARPOL Annex II shall comply with the guidelines adopted by the Organization by resolution A.739(18), as may be amended by the Organization, and the specification adopted by the Organization by resolution A.789(19), as may be amended by the Organization, provided that such amendments are adopted, brought into force and take effect in accordance with the provisions of article 16 of MARPOL and article VIII of SOLAS concerning the amendment procedures applicable to this Code.

1.5.1.3 The Administration nominating surveyors or recognising organisations to conduct surveys shall, as a minimum, empower any nominated surveyor or recognised organisation to:

1. require repairs to a ship; and
2. carry out surveys if requested by the appropriate authorities of a port State.

The Administration shall notify the Organization of the specific responsibilities and conditions of the authority delegated to nominated surveyors or recognised organisations for circulation to the Contracting Governments.

1.5.1.4 When a nominated surveyor or recognised organisation determines that the condition of the ship or its equipment does not correspond substantially with the particulars of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, or is such that the ship is not fit to proceed to sea without danger to the ship, or persons on board, or without presenting unreasonable threat of harm to the marine environment, such surveyor or organisation shall immediately ensure that corrective action is taken and shall in due course notify the Administration. If such corrective action is not taken the Certificate shall be withdrawn and the Administration shall be notified immediately. If the ship is in a port of another Contracting Government, the appropriate authorities of the port State shall also be notified immediately. When an officer of the Administration, a nominated surveyor or a recognised organisation has notified the appropriate authorities of the port State, the Government of the port State concerned shall give such officer, surveyor or organisation any necessary assistance to carry out their obligations under this paragraph. When applicable, the Government of the port State concerned shall take such steps as will ensure that the ship does not sail until it can proceed to sea or leave the port for the purpose of proceeding to the nearest appropriate repair yard available without danger to the ship or persons on board or without presenting an unreasonable threat of harm to the marine environment.

1.5.1.5 In every case, the Administration shall guarantee the completeness and efficiency of the survey, and shall undertake to ensure the necessary arrangements to satisfy this obligation.

1.5.2 Survey requirements

LR 1.5.2(a) The Classification Regulations for New Construction Surveys, the classification of ships not built under Survey and Periodical Survey Regulations are given in Pt 1, Ch 2 and Ch 3 of the Rules for Ships. Pt 1, Ch 3,8 of the Rules for Ships deals specifically with the Periodical Survey regulations for ships for liquid chemicals. The following requirements are also to be complied with.

1.5.2.1 The structure, equipment, fittings, arrangements and material (other than items in respect of which a Cargo Ship Safety Construction Certificate, Cargo Ship Safety Equipment Certificate and Cargo Ship Safety Radio Certificate or Cargo Ship Safety Certificate are issued) of a chemical tanker shall be subjected to the following surveys:

- .1 An initial survey before the ship is put in service or before the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk is issued for the first time, which shall include a complete examination of its structure, equipment, fittings, arrangements and material in so far as the ship is covered by the Code. This survey shall be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code.

LR 1.5.2(b) Particular reference is made to the following paragraphs in the Rules for Ships as applicable to chemical tankers:

Tank testing	Pt 3, Ch 1,8.3 Chapters 12 and 13 of the Rules for Materials
Welding	Pt 3, Ch 10,2.2.7 Pt 3, Ch 10,2.2.10 Pt 3, Ch 10, Table 10.2.1(6) & (7)
Non-destructive Examination	Ch 13,2.12.4 of the Rules for Materials

- .2 A renewal survey at intervals specified by the Administration, but not exceeding 5 years, except where 1.5.6.2.2, 1.5.6.5, 1.5.6.6 or 1.5.6.7 are applicable. The renewal survey shall be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code.
- .3 An intermediate survey within 3 months before or after the second anniversary date or within 3 months before or after the third anniversary date of the Certificate, which shall take the place of one of the annual surveys specified in 1.5.2.1.4. The intermediate survey shall be such as to ensure that the safety equipment, and other equipment, and associate pump and piping systems fully comply with the applicable provisions of the Code and are in good working order. Such intermediate surveys shall be endorsed on the Certificate issued under 1.5.4 or 1.5.5.

General

Chapter 1

Section 5

- .4 An annual survey within 3 months before or after each anniversary date of the Certificate, including a general inspection of the structure, equipment, fittings, arrangements and material referred to in 1.5.2.1.1 to ensure that they have been maintained in accordance with 1.5.3 and that they remain satisfactory for the service for which the ship is intended. Such annual surveys shall be endorsed on the Certificate issued under 1.5.4 or 1.5.5.
- .5 An additional survey, either general or partial according to the circumstances, shall be made when required after an investigation prescribed in 1.5.3.3, or whenever any important repairs or renewals are made. Such a survey shall ensure that the necessary repairs or renewals have been effectively made, that the material and workmanship of such repairs or renewals are satisfactory; and that the ship is fit to proceed to sea without danger to the ship or persons on board or without presenting unreasonable threat of harm to the marine environment.

1.5.3 Maintenance of conditions after survey

1.5.3.1 The condition of the ship and its equipment shall be maintained to conform with the provisions of the Code to ensure that the ship will remain fit to proceed to sea without danger to the ship or persons on board or without presenting unreasonable threat of harm to the marine environment.

1.5.3.2 After any survey of the ship under 1.5.2 has been completed, no change shall be made in the structure, equipment, fittings, arrangements and material covered by the survey, without the sanction of the Administration, except by direct replacement.

1.5.3.3 Whenever an accident occurs to a ship or a defect is discovered, either of which affects the safety of the ship or the efficiency or completeness of its life-saving appliances or other equipment covered by the Code, the master or owner of the ship shall report at the earliest opportunity to the Administration, the nominated surveyor or recognised organisation responsible for issuing the Certificate, who shall cause investigations to be initiated to determine whether a survey, as required by 1.5.2.1.5, is necessary. If the ship is in a port of another Contracting Government, the master or owner shall also report immediately to the port State and the nominated surveyor or recognised organisation shall ascertain that such a report has been made.

1.5.4 Issue or endorsement of International Certificate of Fitness

1.5.4.1 An International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk shall be issued after an initial or renewal survey to a chemical tanker engaged in international voyages which complies with the relevant provisions of the Code.

1.5.4.2 Such a Certificate shall be drawn up in the form corresponding to the model given in the appendix. If the language used is not English, French or Spanish, the text shall include the translation into one of these languages.

1.5.4.3 The Certificate issued under provisions of this section shall be available on board for examination at all times.

1.5.5 Issue or endorsement of International Certificate of Fitness by another Government

1.5.5.1 A Government that is both a Contracting Government to the 1974 SOLAS Convention and a Party to MARPOL 73/78 may, at the request of another such Government, cause a ship entitled to fly the flag of the other State to be surveyed and, if satisfied that the provisions of the Code are complied with, issue or authorise the issue of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk to the ship, and, where appropriate, endorse or authorise the endorsement of the Certificate on board the ship in accordance with the Code. Any Certificate so issued shall contain a statement to the effect that it has been issued at the request of the Government of the State whose flag the ship is entitled to fly.

1.5.6 Duration and validity of International Certificate of Fitness

1.5.6.1 An International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk shall be issued for a period specified by the Administration which shall not exceed 5 years.

1.5.6.2.1 Notwithstanding the provisions of 1.5.6.1, when the renewal survey is completed within 3 months before the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding 5 years from the date of expiry of the existing Certificate.

1.5.6.2.2 When the renewal survey is completed after the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding 5 years from the date of expiry of the existing Certificate.

1.5.6.2.3 When the renewal survey is completed more than 3 months before the expiry date of the existing Certificate, the new Certificate shall be valid from the date of completion of the renewal survey to a date not exceeding 5 years from the date of completion of the renewal survey.

1.5.6.3 If a Certificate is issued for a period of less than 5 years, the Administration may extend the validity of the Certificate beyond the expiry date to the maximum period specified in 1.5.6.1, provided that the surveys referred to in 1.5.2.1.3 and 1.5.2.1.4, applicable when a Certificate is issued for a period of 5 years, are carried out as appropriate.

1.5.6.4 If a renewal survey has been completed and a new Certificate cannot be issued or placed on board the ship before the expiry date of the existing Certificate, the person or organisation authorised by the Administration may endorse the existing Certificate. Such a Certificate shall be accepted as valid for a further period which shall not exceed 5 months from the expiry date.

1.5.6.5 If a ship, at the time when a Certificate expires, is not in a port in which it is to be surveyed, the Administration may extend the period of validity of the Certificate but this extension shall be granted only for the purpose of allowing the ship to complete its voyage to the port in which it is to be surveyed, and then only in cases where it appears proper and reasonable to do so.

1.5.6.6 A Certificate, issued to a ship engaged on short voyages which has not been extended under the foregoing provisions of this section, may be extended by the Administration for a period of grace of up to one month from the date of expiry stated on it. When the renewal survey is completed, the new Certificate shall be valid to a date not exceeding 5 years from the date of expiry of the existing Certificate before the extension was granted.

1.5.6.7 In special circumstances, as determined by the Administration, a new Certificate need not be dated from the date of expiry of the existing Certificate as required by 1.5.6.2.2, 1.5.6.5 or 1.5.6.6. In these special circumstances, the new Certificate shall be valid to a date not exceeding 5 years from the date of completion of the renewal survey.

1.5.6.8 If an annual or intermediate survey is completed before the period specified in 1.5.2, then:

- .1 the anniversary date shown on the Certificate shall be amended by endorsement to a date which shall not be more than 3 months later than the date on which the survey was completed;
- .2 the subsequent annual or intermediate survey required by 1.5.2 shall be completed at the intervals prescribed by that section using the new anniversary date; and
- .3 the expiry date may remain unchanged provided one or more annual or intermediate surveys, as appropriate, are carried out so that the maximum intervals between the surveys prescribed by 1.5.2 are not exceeded.

1.5.6.9 A Certificate issued under 1.5.4 or 1.5.5 shall cease to be valid in any of the following cases:

- .1 if the relevant surveys are not completed within the periods specified under 1.5.2;
- .2 if the Certificate is not endorsed in accordance with 1.5.2.1.3 or 1.5.2.1.4;
- .3 upon transfer of the ship to the flag of another State. A new certificate shall only be issued when the Government issuing the new Certificate is fully satisfied that the ship is in compliance with the requirements of 1.5.3.1 and 1.5.3.2. In the case of a transfer between Governments that are both a Contracting Government to the 1974 SOLAS Convention and a Party to MARPOL 73/78, if requested within 3 months after the transfer has taken place, the Government of the State whose flag the ship was formerly entitled to fly shall, as soon as possible, transmit to the Administration copies of the Certificate carried by the ship before the transfer and, if available, copies of the relevant survey reports.

Ship Survival Capability and Location of Cargo Tanks

Chapter 2

Sections 1, 2 & 3

2.1 General

LR 2.1(a) These requirements for Ship Survival Capability are not classification requirements. However, in cases where LR is authorised to issue the relevant Statutory Certificates, and is requested to do so, the requirements of this Chapter will be applied together with any amendment or interpretation adopted by the appropriate National Authority, see also LR II.2.

2.1.1 Ships, subject to the Code, shall survive the normal effects of flooding following assumed hull damage caused by some external force. In addition, to safeguard the ship and the environment, the cargo tanks of certain types of ships shall be protected from penetration in the case of minor damage to the ship resulting, for example, from contact with a jetty or tug, and given a measure of protection from damage in the case of collision or stranding, by locating them at specified minimum distances inboard from the ship's shell plating. Both the assumed damage and the proximity of the cargo tanks to the ship's shell shall be dependent upon the degree of hazard presented by the products to be carried.

2.1.2 Ships subject to the Code shall be designed to one of the following standards:

- .1 A type 1 ship is a chemical tanker intended to transport chapter 17 products with very severe environmental and safety hazards which require maximum preventive measures to preclude an escape of such cargo.
- .2 A type 2 ship is a chemical tanker intended to transport chapter 17 products with appreciably severe environmental and safety hazards which require significant preventive measures to preclude an escape of such cargo.
- .3 A type 3 ship is a chemical tanker intended to transport chapter 17 products with sufficiently severe environmental and safety hazards which require a moderate degree of containment to increase survival capability in a damaged condition.

Thus, a type 1 ship is a chemical tanker intended for the transportation of products considered to present the greatest overall hazard and type 2 and type 3 for products of progressively lesser hazards. Accordingly, a type 1 ship shall survive the most severe standard of damage and its cargo tanks shall be located at the maximum prescribed distance inboard from the shell plating.

2.1.3 The ship type required for individual products is indicated in *column e* in the table of chapter 17.

2.1.4 If a ship is intended to carry more than one product listed in chapter 17, the standard of damage shall correspond to that product having the most stringent ship type requirement. The requirements for the location of individual cargo tanks, however, are those for ship types related to the respective products intended to be carried.

2.2 Freeboard and intact stability

2.2.1 Ships subject to the Code may be assigned the minimum freeboard permitted by the International Convention on Load Lines in force. However, the draught associated with the assignment shall not be greater than the maximum draught otherwise permitted by this Code.

2.2.2 The stability of the ship in all seagoing conditions shall be to a standard which is acceptable to the Administration.

2.2.3 When calculating the effect of free surfaces of consumable liquids for loading conditions it shall be assumed that, for each type of liquid, at least one transverse pair or a single centre tank has a free surface and the tank or combination of tanks to be taken into account shall be those where the effect of free surfaces is the greatest. The free surface effect in undamaged compartments shall be calculated by a method acceptable to the Administration.

2.2.4 Solid ballast shall not normally be used in double-bottom spaces in the cargo area. Where, however, because of stability considerations, the fitting of solid ballast in such spaces becomes unavoidable, then its disposition shall be governed by the need to ensure that the impact loads resulting from bottom damage are not directly transmitted to the cargo tank structure.

2.2.5 The master of the ship shall be supplied with a loading and stability information booklet. This booklet shall contain details of typical service and ballast conditions, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the booklet shall contain sufficient information to enable the master to load and operate the ship in a safe and seaworthy manner.

2.3 Shipside discharges below the freeboard deck

2.3.1 The provision and control of valves fitted to discharges led through the shell from spaces below the freeboard deck or from within the super-structures and deck-houses on the freeboard deck fitted with weathertight doors shall comply with the requirements of the relevant regulation of the International Convention on Load Lines in force, except that the choice of valves shall be limited to:

- .1 one automatic non-return valve with a positive means of closing from above the freeboard deck; or
- .2 where the vertical distance from the summer load waterline to the inboard end of the discharge pipe exceeds 0.01L, two automatic non-return valves without positive means of closing, provided that the inboard valve is always accessible for examination under service conditions.

2.3.2 For the purpose of this chapter, "summer load line" and "freeboard deck" have the meanings as defined in the International Convention on Load Lines in force.

Ship Survival Capability and Location of Cargo Tanks

Chapter 2

Sections 3 to 7

2.3.3 The automatic non-return valves referred to in 2.3.1.1 and 2.3.1.2 shall be fully effective in preventing admission of water into the ship, taking into account the sinkage, trim and heel in survival requirements in 2.9, and shall comply with recognised standards.

2.4 Conditions of loading

Damage survival capability shall be investigated on the basis of loading information submitted to the Administration for all anticipated conditions of loading and variations in draught and trim. Ballast conditions where the chemical tanker is not carrying products covered by the Code, or is carrying only residues of such products, need not be considered.

2.5 Damage assumptions

2.5.1 The assumed maximum extent of damage shall be:

.1	Side damage:		
.1.1	Longitudinal extent:	$1/3L^{2/3}$ or 14.5 m, whichever is less	
.1.2	Transverse extent:	B/5 or 11.5 m, whichever is less (measured inboard from the ship's side at right angles to the centreline at the level of the summer load line)	
.1.3	Vertical extent:	upwards without limit (measured from the moulded line of the bottom shell plating at centreline)	
.2	Bottom damage:	For 0,3L from the forward perpendicular of the ship	Any other part of the ship
.2.1	Longitudinal extent:	$1/3L^{2/3}$ or 14.5 m, whichever is less	$1/3L^{2/3}$ or 5 m, whichever is less
.2.2	Transverse extent:	B/6 or 10 m, whichever is less	B/6 or 5 m, whichever is less
.2.3	Vertical extent:	B/15 or 6 m, whichever is less [measured from the moulded line of the bottom shell plating at centreline, (see 2.6.2)]	B/15 or 6 m, whichever is less [measured from the moulded line of the bottom shell plating at centreline, (see 2.6.2)]

2.5.2 If any damage of a lesser extent than the maximum damage specified in 2.5.1 would result in a more severe condition, such damage shall be considered.

2.6 Location of cargo tanks

2.6.1 Cargo tanks shall be located at the following distances inboard:

- .1 Type 1 ships: from the side shell plating, not less than the transverse extent of damage specified in 2.5.1.1.2, and from the moulded line of the bottom shell plating at centreline, not less than the vertical extent of damage specified in 2.5.1.2.3, and nowhere less than 760 mm from the shell plating. This requirement does not apply to the tanks for diluted slops arising from tank washing.
- .2 Type 2 ships: from the moulded line of the bottom shell plating at centreline, not less than the vertical extent of damage specified in 2.5.1.2.3, and nowhere less than 760 mm from the shell plating. This requirement does not apply to the tanks for diluted slops arising from tank washing.
- .3 Type 3 ships: no requirement.

2.6.2 Except for type 1 ships, suction wells installed in cargo tanks may protrude into the vertical extent of bottom damage specified in 2.5.1.2.3 provided that such wells are as small as practicable and the protrusion below the inner bottom plating does not exceed 25% of the depth of the double bottom or 350 mm, whichever is less. Where there is no double bottom, the protrusion of the suction well of independent tanks below the upper limit of bottom damage shall not exceed 350 mm. Suction wells installed in accordance with this paragraph may be ignored in determining the compartments affected by damage.

2.7 Flooding assumptions

2.7.1 The requirements of 2.9 shall be confirmed by calculations which take into consideration the design characteristics of the ship; the arrangements, configuration and contents of the damaged compartments; the distribution, relative densities and the free surface effects of liquids; and the draught and trim for all conditions of loading.

2.7.2 The permeabilities of spaces assumed to be damaged shall be as follows:

Spaces	Permeabilities
Appropriated to stores	0.60
Occupied by accommodation	0.95
Occupied by machinery	0.85
Voids	0.95
Intended for consumable liquids	0 to 0.95*
Intended for other liquids	0 to 0.95*

2.7.3 Wherever damage penetrates a tank containing liquids it shall be assumed that the contents are completely lost from that compartment and replaced by salt water up to the level of the final plane of equilibrium.

* The permeability of partially filled compartments shall be consistent with the amount of liquid carried in the compartment.

Ship Survival Capability and Location of Cargo Tanks

Chapter 2

Sections 7, 8 & 9

2.7.4 Every watertight division within the maximum extent of damage defined in 2.5.1 and considered to have sustained damage in positions given in 2.8.1 shall be assumed to be penetrated. Where damage less than the maximum is being considered in accordance with 2.5.2, only watertight divisions or combinations of watertight divisions within the envelope of such lesser damage shall be assumed to be penetrated.

2.7.5 The ship shall be so designed as to keep unsymmetrical flooding to the minimum consistent with efficient arrangements.

2.7.6 Equalisation arrangements requiring mechanical aids such as valves or cross-levelling pipes, if fitted, shall not be considered for the purpose of reducing an angle of heel or attaining the minimum range of residual stability to meet the requirements of 2.9 and sufficient residual stability shall be maintained during all stages where equalisation is used. Spaces which are linked by ducts of large cross-sectional area may be considered to be common.

2.7.7 If pipes, ducts, trunks or tunnels are situated within the assumed extent of damage penetration, as defined in 2.5, arrangements shall be such that progressive flooding cannot thereby extend to compartments other than those assumed to be flooded for each case of damage.

2.7.8 The buoyancy of any superstructure directly above the side damage shall be disregarded. The unflooded parts of superstructures beyond the extent of damage, however, may be taken into consideration provided that:

- .1 they are separated from the damaged space by watertight divisions and the requirements of 2.9.3 in respect of these intact spaces are complied with; and
- .2 openings in such divisions are capable of being closed by remotely operated sliding watertight doors and unprotected openings are not immersed within the minimum range of residual stability required in 2.9; however, the immersion of any other openings capable of being closed weathertight may be permitted.

2.8 Standard of damage

2.8.1 Ships shall be capable of surviving the damage indicated in 2.5 with the flooding assumptions in 2.7 to the extent determined by the ship's type according to the following standards:

- .1 A type 1 ship shall be assumed to sustain damage anywhere in its length.
- .2 A type 2 ship of more than 150 m in length shall be assumed to sustain damage anywhere in its length.
- .3 A type 2 ship of 150 m in length or less shall be assumed to sustain damage anywhere in its length except involving either of the bulkheads bounding a machinery space located aft.
- .4 A type 3 ship of more than 225 m in length should be assumed to sustain damage anywhere in its length.

.5 A type 3 ship of 125 m in length or more but not exceeding 225 m in length shall be assumed to sustain damage anywhere in its length except involving either of the bulkheads bounding a machinery space located aft.

.6 A type 3 ship below 125 m in length shall be assumed to sustain damage anywhere in its length except involving damage to the machinery space when located aft. However, the ability to survive the flooding of the machinery space shall be considered by the Administration.

2.8.2 In the case of small type 2 and type 3 ships which do not comply in all respects with the appropriate requirements of 2.8.1.3 and 2.8.1.6, special dispensation may only be considered by the Administration provided that alternative measures can be taken which maintain the same degree of safety. The nature of the alternative measures shall be approved and clearly stated and be available to the port Administration. Any such dispensation shall be duly noted on the International Certificate of Fitness referred to in 1.5.4.

2.9 Survival requirements

2.9.1 Ships subject to the Code shall be capable of surviving the assumed damage specified in 2.5 to the standard provided in 2.8 in a condition of stable equilibrium and shall satisfy the following criteria.

2.9.2 In any stage of flooding:

- .1 the waterline, taking into account sinkage, heel and trim, shall be below the lower edge of any opening through which progressive flooding or downflooding may take place. Such openings shall include air pipes and openings which are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and watertight flush scuttles, small watertight cargo-tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors, and sidescuttles of the non-opening type;
- .2 the maximum angle of heel due to unsymmetrical flooding shall not exceed 25°, except that this angle may be increased to 30° if no deck immersion occurs;
- .3 the residual stability during intermediate stages of flooding shall be to the satisfaction of the Administration. However, it shall never be significantly less than that required by 2.9.3.

-
- 2.9.3 At final equilibrium after flooding:
- .1 The righting-lever curve shall have a minimum range of 20° beyond the position of equilibrium in association with a maximum residual righting lever of at least 0.1 m within the 20° range; the area under the curve within this range shall not be less than 0.0175 m radians. Unprotected openings shall not be immersed within this range unless the space concerned is assumed to be flooded. Within this range, the immersion of any of the openings listed in 2.9.2.1 and other openings capable of being closed weathertight may be permitted; and
 - .2 the emergency source of power shall be capable of operating.

Ship Arrangements

Chapter 3

Sections 1, 2 & 3

3.1 Cargo segregation

3.1.1 Unless expressly provided otherwise, tanks containing cargo or residues of cargo subject to the Code shall be segregated from accommodation, service and machinery spaces and from drinking water and stores for human consumption by means of a cofferdam, void space, cargo pump-room, pump-room, empty tank, oil fuel tank or other similar space.

LR 3.1(a) Segregation of cargo tanks from spaces which are intended to be non-hazardous, where diagonal or corner to corner situations may occur, will require to be specially considered. See also Pt 4, Ch 9, 1.2.9 of the Rules for Ships.

3.1.2 Cargo piping shall not pass through any accommodation, service or machinery space other than cargo pump-rooms or pump-rooms.

3.1.3 Cargoes, residues of cargoes or mixtures containing cargoes, which react in a hazardous manner with other cargoes, residues or mixtures, shall:

- .1 be segregated from such other cargoes by means of a cofferdam, void space, cargo pump-room, pump-room, empty tank, or tank containing a mutually compatible cargo;
- .2 have separate pumping and piping systems which shall not pass through other cargo tanks containing such cargoes, unless encased in a tunnel; and
- .3 have separate tank venting systems.

3.1.4 If cargo piping systems or cargo ventilation systems are to be separated. This separation may be achieved by the use of design or operational methods. Operational methods shall not be used within a cargo tank and shall consist of one of the following types:

- .1 removing spool-pieces or valves and blanking the pipe ends;
- .2 arrangement of two spectacle flanges in series, with provisions for detecting leakage into the pipe between the two spectacle flanges.

3.1.5 Cargoes subject to the Code shall not be carried in either the fore or aft peak tank.

LR 3.1(b) The cargoes referred to in 3.1.1, 3.1.2 and 3.1.4 for the purpose of these Rules are those listed in Chapter 17, or those cargoes referred to in paragraph 4 of the Preamble.

3.2 Accommodation, service and machinery spaces and control stations

3.2.1 No accommodation or service spaces or control stations shall be located within the cargo area except over a cargo pump-room recess or pump-room recess that complies with SOLAS regulations II-2/4.5.1 to 4.5.2.4 and no cargo or slop tank shall be aft of the forward end of any accommodation.

LR 3.2(a) Accommodation or service spaces or control stations may be situated over an oil fuel tank having a common boundary to a cargo or slop tank provided all other relevant requirements of these Rules and the Rules for Ships are complied with.

3.2.2 In order to guard against the danger of hazardous vapours, due consideration shall be given to the location of air intakes and openings into accommodation, service and machinery spaces and control stations in relation to cargo piping and cargo vent systems.

LR 3.2(b) Compliance with 3.2.1, 3.2.3, 3.7, 5.2, 8.2.2, 12.1.5 and 15.12, where applicable, will also satisfy the requirements of 3.2.2.

3.2.3 Entrances, air inlets and openings to accommodation, service and machinery spaces and control stations shall not face the cargo area. They shall be located on the end bulkhead not facing the cargo area and/or on the outboard side of the superstructure or deck-house at a distance of at least 4% of the length (L) of the ship but not less than 3 m from the end of the superstructure or deck-house facing the cargo area. This distance, however, need not exceed 5 m. No doors shall be permitted within the limits mentioned above, except that doors to those spaces not having access to accommodation and service spaces and control stations, such as cargo control stations and store-rooms may be fitted. Where such doors are fitted, the boundaries of the space shall be insulated to "A-60" standard. Bolted plates for removal of machinery may be fitted within the limits specified above. Wheelhouse doors and wheelhouse windows may be located within the limits specified above so long as they are so designed that a rapid and efficient gas- and vapour-tightening of the wheelhouse can be ensured. Windows and sidescuttles facing the cargo area and on the sides of the superstructures and deck-houses within the limits specified above shall be of the fixed (non-opening) type. Such sidescuttles in the first tier on the main deck shall be fitted with inside covers of steel or equivalent material.

LR 3.2(c) Spaces such as cargo control stations and store rooms not having access to accommodation and service spaces and control stations, as specified in 3.2.3 are to be provided with mechanical ventilation as per Chapter 12, as appropriate to the designated use. Instructions are to be posted for gas-freeing prior to entry.

3.3 Cargo pump-rooms

3.3.1 Cargo pump-rooms shall be so arranged as to ensure:

- .1 unrestricted passage at all times from any ladder platform and from the floor; and
- .2 unrestricted access to all valves necessary for cargo handling for a person wearing the required personnel protective equipment.

3.3.2 Permanent arrangements shall be made for hoisting an injured person with a rescue line while avoiding any projecting obstacles.

3.3.3 Guard railings shall be installed on all ladders and platforms.

Ship Arrangements

Chapter 3

Sections 3 to 6

3.3.4 Normal access ladders shall not be fitted vertical and shall incorporate platforms at suitable intervals.

3.3.5 Means shall be provided to deal with drainage and any possible leakage from cargo pumps and valves in cargo pump-rooms. The bilge system serving the cargo pump-room shall be operable from outside the cargo pump-room. One or more slop tanks for storage of contaminated bilge water or tank washings shall be provided. A shore connection with a standard coupling or other facilities shall be provided for transferring contaminated liquids to onshore reception facilities.

LR 3.3(a) All shut-off valves incorporated in bilge systems are to be operable from outside the cargo pump-room. Any suitable cargo tank may be used as a slop tank.

3.3.6 Pump discharge pressure gauges shall be provided outside the cargo pump-room.

LR 3.3(b) For the purpose of 3.3.6 the definition of cargo pump-room is to include any cargo pump-room entrance spaces. See also 1.3.6.

3.3.7 Where machinery is driven by shafting passing through a bulkhead or deck, gastight seals with efficient lubrication or other means of ensuring the permanence of the gas seal shall be fitted in way of the bulkhead or deck.

LR 3.3(c) The gastight glands are to be of an approved type and lubricated from outside the pump-room. See Pt 5, Ch 15,3.2 of the Rules for Ships.

3.4 Access to spaces in the cargo area

3.4.1 Access to cofferdams, ballast tanks, cargo tanks and other spaces in the cargo area shall be direct from the open deck and such as to ensure their complete inspection. Access to double bottom spaces may be through a cargo pump-room, pump-room, deep cofferdam, pipe tunnel or similar compartments, subject to consideration of ventilation aspects.

LR 3.4(a) Spaces which are of confined or cellular construction adjacent to cargo or slop tanks such as double bottom tanks and cofferdams are to have dual access from the upper deck, spaced as widely apart as possible. Pipe tunnels and duct keels to which access is normally required for operational purposes, are to be provided with means of access not more than 60 m apart. In all cases, however, access is to be provided at each end of the tunnel or duct keel.

3.4.2 For access through horizontal openings, hatches or manholes, the dimensions shall be sufficient to allow a person wearing a self-contained air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the space. The minimum clear opening shall be not less than 600 mm by 600 mm.

3.4.3 For access through vertical openings, or manholes providing passage through the length and breadth of the space, the minimum clear opening shall be not less than 600 mm by 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

3.4.4 Smaller dimensions may be approved by the Administration in special circumstances, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of the Administration.

LR 3.4(b) When dimensions of openings smaller than those required in 3.4.2 and 3.4.3 are found to be unavoidable, equivalent area should be obtained wherever practicable. Where this cannot be achieved, openings should be as large as practicable and suitable additional operational procedures for gas-freeing before entry (such as flooding and emptying of double bottom tanks) should be submitted for consideration.

3.5 Bilge and ballast arrangements

3.5.1 Pumps, ballast lines, vent lines and other similar equipment serving permanent ballast tanks shall be independent of similar equipment serving cargo tanks and of cargo tanks themselves. Discharge arrangements for permanent ballast tanks sited immediately adjacent to cargo tanks shall be outside machinery spaces and accommodation spaces. Filling arrangements may be in the machinery spaces provided that such arrangements ensure filling from tank deck level and non-return valves are fitted.

3.5.2 Filling of ballast in cargo tanks may be arranged from deck level by pumps serving permanent ballast tanks, provided that the filling line has no permanent connection to cargo tanks or piping and that non-return valves are fitted.

LR 3.5(a) The ballast pump referred to is to be located outside the machinery and accommodation spaces and in most cases would be located in a below deck cargo or ballast pump-room. The connection to the cargo tank is to be made by means of a removable pipe length and the filling pipe is to be fitted with isolating and non-return valves and led to as low a level as practicable within the tank.

3.5.3 Bilge pumping arrangements for cargo pump-rooms, pump-rooms, void spaces, slop tanks, double-bottom tanks and similar spaces shall be situated entirely within the cargo area except for void spaces, double-bottom tanks and ballast tanks where such spaces are separated from tanks containing cargo or residues of cargo by a double bulkhead.

3.6 Pump and pipeline identification

Provisions shall be made for the distinctive marking of pumps, valves and pipelines to identify the service and tanks which they serve.

Ship Arrangements

Chapter 3

Section 7

3.7 Bow or stern loading and unloading arrangements

3.7.1 Cargo piping may be fitted to permit bow or stern loading and unloading. Portable arrangements shall not be permitted.

3.7.2 Bow or stern loading and unloading lines shall not be used for the transfer of products required to be carried in type 1 ships. Bow and stern loading and unloading lines shall not be used for the transfer of cargoes emitting toxic vapours required to comply with 15.12.1, unless specifically approved by the Administration.

3.7.3 In addition to 5.1, the following provisions apply:

- .1 The piping outside the cargo area shall be fitted at least 760 mm inboard on the open deck. Such piping shall be clearly identified and fitted with a shutoff valve at its connection to the cargo piping system within the cargo area. At this location, it shall also be capable of being separated by means of a removable spool-piece and blank flanges when not in use.
- .2 The shore connection shall be fitted with a shut-off valve and a blank flange.
- .3 The piping shall be full-penetration butt-welded, and fully radiographed. Flange connections in the piping shall only be permitted within the cargo area and at the shore connection.
- .4 Spray shields shall be provided at the connections specified in 3.7.3.1 as well as collecting trays of sufficient capacity, with means for the disposal of drainage.
- .5 The piping shall be self-draining to the cargo area and preferably into a cargo tank. Alternative arrangements for draining the piping may be accepted by the Administration.
- .6 Arrangements shall be made to allow such piping to be purged after use and maintained gas-safe when not in use. The vent pipes connected with the purge shall be located in the cargo area. The relevant connections to the piping shall be provided with a shutoff valve and blank flange.

3.7.4 Entrances, air inlets and openings to accommodation, service and machinery spaces and control stations shall not face the cargo shore-connection location of bow or stern loading and unloading arrangements. They shall be located on the outboard side of the superstructure or deck-house at a distance of at least 4% of the length of the ship but not less than 3 m from the end of the house facing the cargo shore-connection location of the bow or stern loading and unloading arrangements. This distance, however, need not exceed 5 m. Sidescuttles facing the shore-connection location and on the sides of the superstructure or deck-house within the distance mentioned above shall be of the fixed (non-opening) type. In addition, during the use of the bow or stern loading and unloading arrangements, all doors, ports and other openings on the corresponding superstructure or deck-house side shall be kept closed. Where, in the case of small ships, compliance with 3.2.3 and this paragraph is not possible, the Administration may approve relaxations from the above requirements.

3.7.5 Air pipes and other openings to enclosed spaces not listed in 3.7.4 shall be shielded from any spray which may come from a burst hose or connection.

3.7.6 Escape routes shall not terminate within the coamings required by 3.7.7 or within a distance of 3 m beyond the coamings.

3.7.7 Continuous coamings of suitable height shall be fitted to keep any spills on deck and away from the accommodation and service areas.

3.7.8 Electrical equipment within the coamings required by 3.7.7 or within a distance of 3 m beyond the coamings shall be in accordance with the requirements of chapter 10.

3.7.9 Fire-fighting arrangements for the bow or stern loading and unloading areas shall be in accordance with 11.3.16.

3.7.10 Means of communication between the cargo control station and the cargo shore-connection location shall be provided and certified safe, if necessary. Provision shall be made for the remote shutdown of cargo pumps from the cargo shore-connection location.

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Cargo Containment

Chapter 4

Sections 1 & 2

4.1 Definitions

4.1.1 *Independent tank* means a cargo-containment envelope, which is not contiguous with, or part of, the hull structure. An independent tank is built and installed so as to eliminate whenever possible (or in any event to minimise) its stressing as a result of stressing or motion of the adjacent hull structure. An independent tank is not essential to the structural completeness of the ship's hull.

4.1.2 *Integral tank* means a cargo-containment envelope which forms part of the ship's hull and which may be stressed in the same manner and by the same loads which stress the contiguous hull structure and which is normally essential to the structural completeness of the ship's hull.

4.1.3 *Gravity tank* means a tank having a design pressure not greater than 0.07 MPa gauge at the top of the tank. A gravity tank may be independent or integral. A gravity tank shall be constructed and tested according to recognised standards, taking account of the temperature of carriage and relative density of the cargo.

4.1.4 *Pressure tank* means a tank having a design pressure greater than 0.07 MPa gauge. A pressure tank shall be an independent tank and shall be of a configuration permitting the application of pressure-vessel design criteria according to recognised standards.

LR 4.1(a) Integral tank scantlings and arrangements

LR 4.1(a).1 Integral cargo tank scantlings and arrangements are to be in accordance with Chapter LR V.

LR 4.1(b) Independent tank scantlings and arrangements

LR 4.1(b).1 The scantlings and arrangements will be considered on the basis of the standards contained in the Rules for Ships for Liquefied Gases, taking account of the cargo relative densities.

LR 4.1(b).2 Consideration is to be given to the maximum pressure which will be encountered in service and account is to be taken of the dynamic loading which will be experienced by the tanks, supports and keys. Calculations are to be submitted to enable the appraisal of the proposed arrangements.

LR 4.1(b).3 Where it is intended to carry high temperature cargoes, the tanks are to be supported and keyed so as to permit free expansion in all directions and eliminate heat bridges which may transmit thermal stresses to the hull of the ship.

LR 4.1(b).4 All openings should be in the top of the tank and extended above the deck. Access is to be from the open deck direct with arrangements for maintaining watertightness at the joint between the hatch coaming and the deck.

4.2 Tank type requirements for individual products

Requirements for both installation and design of tank types for individual products are shown in *column f* in the table of chapter 17.

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Cargo Transfer

Chapter 5

Sections 1 & 2

5.1 Piping scantlings

5.1.1 Subject to the conditions stated in 5.1.4 the wall thickness (t) of pipes shall not be less than:

$$t = \frac{t_o + b + c}{1 - \frac{a}{100}} \quad (\text{mm})$$

where:

t_o = theoretical thickness

$t_o = PD/(K_e + P)$ (mm)

with

P = design pressure (MPa) referred to in 5.1.2

D = outside diameter (mm)

K = allowable stress (N/mm²) referred to in 5.1.5

e = efficiency factor equal to 1.0 for seamless pipes and for longitudinally or spirally welded pipes, delivered by approved manufacturers of welded pipes, which are considered equivalent to seamless pipes when non-destructive testing on welds is carried out in accordance with recognised standards. In other cases, an efficiency factor of less than 1.0, in accordance with recognised standards, may be required depending on the manufacturing process.

b = allowance for bending (mm). The value of b shall be chosen so that the calculated stress in the bend, due to internal pressure only, does not exceed the allowable stress. Where such justification is not given, b shall be not less than:

$$b = \frac{Dt_o}{2.5r} \quad (\text{mm})$$

with

r = mean radius of the bend (mm).

c = corrosion allowance (mm). If corrosion or erosion is expected, the wall thickness of piping shall be increased over that required by the other design requirements.

a = negative manufacturing tolerance for thickness (%).

5.1.2 The design pressure P in the formula for t_o in 5.1.1 is the maximum gauge pressure to which the system may be subjected in service, taking into account the highest set pressure on any relief valve on the system.

5.1.3 Piping and piping-system components which are not protected by a relief valve, or which may be isolated from their relief valve, shall be designed for at least the greatest of:

- .1 for piping systems or components which may contain some liquid, the saturated vapour pressure at 45°C;
- .2 the pressure setting of the associated pump discharge relief valve;
- .3 the maximum possible total pressure head at the outlet of the associated pumps when a pump discharge relief valve is not installed.

5.1.4 The design pressure shall not be less than 1 MPa gauge except for open-ended lines, where it shall be not less than 0.5 MPa gauge.

5.1.5 For pipes, the allowable stress K to be considered in the formula for t_o in 5.1.1 is the lower of the following values:

$$\frac{R_m}{A} \quad \text{or} \quad \frac{R_e}{B}$$

where

R_m = specified minimum tensile strength at ambient temperature (N/mm²)

R_e = specified minimum yield stress at ambient temperature (N/mm²). If the stress-strain curve does not show a defined yield stress, the 0.2% proof stress applies.

A and B should have values of at least A = 2.7 and B = 1.8.

5.1.6.1 The minimum wall thickness shall be in accordance with recognised standards.

LR 5.1(a) The nominal thickness of steel pipes is to be not less than shown in Table 12.2.4 in Pt 5, Ch 12 of the Rules for Ships.

LR 5.1(b) Stainless steel pipes will receive special consideration.

5.1.6.2 Where necessary for mechanical strength to prevent damage, collapse, excessive sag or buckling of pipes due to weight of pipes and content and to superimposed loads from supports, ship deflection or other causes, the wall thickness shall be increased over that required by 5.1.1 or, if this is impracticable or would cause excessive local stresses, these loads shall be reduced, protected against or eliminated by other design methods.

5.1.6.3 Flanges, valves and other fittings shall be in accordance with recognised standards, taking into account the design pressure defined under 5.1.2.

5.1.6.4 For flanges not complying with a standard, the dimensions for flanges and associated bolts should be to the satisfaction of the Administration.

5.2 Piping fabrication and joining details

5.2.1 The requirements of this section apply to piping inside and outside the cargo tanks. However, relaxations from these requirements may be accepted in accordance with recognised standards for open-ended piping and for piping inside cargo tanks except for cargo piping serving other cargo tanks.

- 5.2.2 Cargo piping shall be joined by welding except:
- .1 for approved connections to shutoff valves and expansion joints; and
 - .2 for other exceptional cases specifically approved by the Administration.

Cargo Transfer

Chapter 5

Sections 2 to 6

5.2.3 The following direct connections of pipe lengths without flanges may be considered:

- .1 Butt-welded joints with complete penetration at the root may be used in all applications.
- .2 Slip-on welded joints with sleeves and related welding having dimensions in accordance with recognised standards shall only be used for pipes with an external diameter of 50 mm or less. This type of joint shall not be used when crevice corrosion is expected to occur.
- .3 Screwed connections, in accordance with recognised standards, shall only be used for accessory lines and instrumentation lines with external diameters of 25 mm or less.

5.2.4 Expansion of piping shall normally be allowed for by the provision of expansion loops or bends in the piping system.

- .1 Bellows, in accordance with recognised standards, may be specially considered.
- .2 Slip joints shall not be used.

5.2.5 Welding, post-weld heat treatment and non-destructive testing shall be performed in accordance with recognised standards.

LR 5.2(a) Welding, post heat treatment and non-destructive examination is also to be in accordance with the requirements of Chapter 13 of the Rules for Materials.

5.3 Flange connections

5.3.1 Flanges shall be of the welded-neck, slip-on or socket-welded type. However, socket-welded-type flanges shall not be used in nominal size above 50 mm.

5.3.2 Flanges shall comply with recognised standards as to their type, manufacture and test.

5.4 Test requirements for piping

5.4.1 The test requirements of this section apply to piping inside and outside cargo tanks. However, relaxations from these requirements may be accepted in accordance with recognised standards for piping inside tanks and open-ended piping.

5.4.2 After assembly, each cargo piping system shall be subject to a hydrostatic test to at least 1.5 times the design pressure. When piping systems or parts of systems are completely manufactured and equipped with all fittings, the hydrostatic test may be conducted prior to installation aboard the ship. Joints welded on board shall be hydrostatically tested to at least 1.5 times the design pressure.

5.4.3 After assembly on board, each cargo piping system shall be tested for leaks to a pressure depending on the method applied.

5.5 Piping arrangements

5.5.1 Cargo piping shall not be installed under deck between the out-board side of the cargo-containment spaces and the skin of the ship unless clearances required for damage protection (see 2.6) are maintained; but such distances may be reduced where damage to the pipe would not cause release of cargo provided that the clearance required for inspection purposes is maintained.

5.5.2 Cargo piping located below the main deck may run from the tank it serves and penetrate tank bulkheads or boundaries common to longitudinally or transversally adjacent cargo tanks, ballast tanks, empty tanks, pump-rooms or cargo pump-rooms provided that inside the tank it serves it is fitted with a stop-valve operable from the weather deck and provided cargo compatibility is assured in the event of piping failure. As an exception, where a cargo tank is adjacent to a cargo pump-room, the stop valve operable from the weather deck may be situated on the tank bulkhead on the cargo pump-room side, provided an additional valve is fitted between the bulkhead valve and the cargo pump. A totally enclosed hydraulically operated valve located outside the cargo tank may, however, be accepted, provided that the valve is:

- .1 designed to preclude the risk of leakage;
- .2 fitted on the bulkhead of the cargo tank which it serves;
- .3 suitably protected against mechanical damage;
- .4 fitted at a distance from the shell as required for damage protection; and
- .5 operable from the weather deck.

5.5.3 In any cargo pump-room where a pump serves more than one tank, a stop valve shall be fitted in the line to each tank.

5.5.4 Cargo piping installed in pipe tunnels shall also comply with the requirements of 5.5.1 and 5.5.2. Pipe tunnels shall satisfy all tank requirements for construction, location and ventilation and electrical hazard requirements. Cargo compatibility shall be assured in the event of a piping failure. The tunnel shall not have any other openings except to the weather deck and cargo pump-room or pump-room.

5.5.5 Cargo piping passing through bulkheads shall be so arranged as to preclude excessive stresses at the bulkhead and shall not utilise flanges bolted through the bulkhead.

5.6 Cargo transfer control systems

5.6.1 For the purpose of adequately controlling the cargo, cargo-transfer systems shall be provided with:

- .1 one stop-valve capable of being manually operated on each tank filling and discharge line, located near the tank penetration; if an individual deepwell pump is used to discharge the contents of a cargo tank, a stop-valve is not required on the discharge line of that tank;
- .2 one stop valve at each cargo-hose connection;
- .3 remote shutdown devices for all cargo pumps and similar equipment.

Cargo Transfer

Chapter 5

Sections 6 & 7

LR 5.6(a) Standby means for pumping out each cargo tank are to be provided. See Pt 5, Ch 15,3.1.2 of the Rules for Ships.

5.6.2 The controls necessary during transfer or transport of cargoes covered by the Code other than in cargo pump-rooms which have been dealt with elsewhere in the Code shall not be located below the weather deck.

5.6.3 For certain products, additional cargo-transfer control requirements are shown in *column o* in the table of chapter 17.

5.7 Ship's cargo hoses

5.7.1 Liquid and vapour hoses used for cargo transfer shall be compatible with the cargo and suitable for the cargo temperature.

LR 5.7(a) Details of such hoses are to be submitted together with a type test certificate issued by a recognised Authority.

5.7.2 Hoses subject to tank pressure or the discharge pressure of pumps shall be designed for a bursting pressure not less than 5 times the maximum pressure the hose will be subjected to during cargo transfer.

5.7.3 For cargo hoses installed on board ships on or after 1 July 2002, each new type of cargo hose, complete with end-fittings, shall be prototype-tested at a normal ambient temperature with 200 pressure cycles from zero to at least twice the specified maximum working pressure. After this cycle pressure test has been carried out, the prototype test shall demonstrate a bursting pressure of at least five times its specified maximum working pressure at the extreme service temperature. Hoses used for prototype testing shall not be used for cargo service. Thereafter, before being placed in service, each new length of cargo hose produced shall be hydrostatically tested at ambient temperature to a pressure not less than 1.5 times its specified maximum working pressure but not more than two-fifths of its bursting pressure. The hose shall be stencilled or otherwise marked with the date of testing, its specified maximum working pressure and, if used in services other than the ambient temperature services, its maximum and minimum service temperature, as applicable. The specified maximum working pressure shall not be less than 1 MPa gauge.

LR 5.7(b) The term 'extreme' in the eighth line of the above refers to the highest and/or lowest service temperature for which the hose is intended.

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Materials of Construction and Welding

Chapter 6

Sections 1 to 3

6.1 Structural materials used for tank construction, together with associated piping, pumps, valves, vents and their jointing materials, shall be suitable at the temperature and pressure for the cargo to be carried in accordance with recognised standards. Steel is assumed to be the normal material of construction.

6.2 The shipyard is responsible for providing compatibility information to the ship operator and/or master. This must be done in a timely manner before delivery of the ship or on completion of a relevant modification of the material of construction.

LR 6.2(a) The requirement of 6.2 only deals with the compatibility of the material of construction with the intended cargoes. Material of construction is to comply with the requirements of the Rules for Materials and any modification of the material of construction is to be submitted for approval.

6.3 Where applicable, the following should be taken into account in selecting the material of construction:

- .1 notch ductility at the operating temperature;
- .2 corrosive effect of the cargo; and
- .3 possibility of hazardous reactions between the cargo and the material of construction.

LR 6.3(a) Except where otherwise required by the provisions of this Code the materials are to comply with the Rules for Materials.

LR 6.3(b) Materials for cargo piping systems are to comply with the requirements of Pt 5, Ch 12 of the Rules for Ships for Class II systems. Materials for open ended and vent piping may be to Class III requirements. See also LR 6.3(h).

LR 6.3(c) The grade of steel to be used in hull construction is in general related to the thickness of the material and, stress pattern associated with its location and notch ductility at the minimum operating temperature. Steels with different levels of notch toughness are specified in the Rules for Materials.

LR 6.3(d) The material grade requirements for different hull members are given in Pt 3, Ch 2,2 of the Rules for Ships.

LR 6.3(e) Where product purity is particularly important, a material of enhanced corrosion resistance may be necessary, and the shipyard shall advise accordingly, see 6.2.

LR 6.3(f) Hatch packing material is to be resistant to both the liquids and vapours to which it is exposed and is to be efficiently held in place.

LR 6.3(g) When aluminium is used in tank construction, requirements for the material are to comply with the Rules for Materials.

LR 6.3(h) Where stainless steel is required or accepted as an alternative to mild steel then it is to be essentially an austenitic or duplex type and comply with the appropriate requirements of the Rules for Materials. Alternative, austenitic or duplex grades of stainless steel may be accepted provided they comply with National or Proprietary specifications and are suitable for the intended purpose.

LR 6.3(i) The surface finish specification and permissible repair procedures for stainless steel surfaces for cargo tanks are to be agreed between the Owner, the Builder and the steel supplier of the stainless steel plate or clad carbon steel plate on the purchase order, see also LR IV.1(a)(ii).

LR 6.3(k) In general, stainless steel tanks are not to be used for the carriage of sea water. Mild steel fittings are not permitted in stainless steel cargo tanks.

LR 6.3(l) The suitability of coatings and compatibility with intended cargoes are the responsibility of the Builder and the Owner. A copy of the coating manufacturer's product resistance list is to be placed on board.

LR 6.3(m) Materials of construction having a melting point below 925°C, e.g., aluminium and its alloys, should not be used for external piping involved in cargo-handling operations on ships intended for the carriage of products with flashpoints not exceeding 60°C (closed cup test) unless specified by the shipyard, see 6.2. Short lengths of external pipes connected to cargo tanks may be fitted if they are provided with fire-resistant insulation. These requirements do not apply to cargo hoses.

LR 6.3(n) Where a pre-fabrication primer is used, it is to comply with the requirements of Pt 3, Ch 2,3 of the Rules for Ships.

LR 6.3(o) Pre-fabrication primers containing zinc are not to be applied to stainless steel. Where zinc primers are applied to other materials which are to be welded, the arrangements are to be such as to preclude zinc contamination of the stainless steel components.

LR 6.3(p) See 15.11.2 concerning the lining of tanks and piping systems.

LR 6.3(q) Where applicable, a sacrificial anode cathodic protection system may be used for the protection of the ballast tanks providing there is no other limitation on the use of the anode material. For details of anode design, attachment and location see Pt 3, Ch 2,3 of the Rules for Ships.

LR 6.3(r) Where special structural materials and linings have been used, a plan showing the location and grades of material utilised is to be placed on board the ship.

LR 6.3(s) Welding is to be performed using welding procedures that have been qualified by testing in accordance with Chapter 12 of the Rules for Materials.

Materials of Construction and Welding

Chapter 6

Sections 3, 4 & 5

LR 6.3(t) Welders and welder operators are to possess the necessary skills for the type of materials to be welded and the quality of work to be undertaken. Welders are to be qualified in accordance with the requirements of Chapter 12 of the Rules for Materials.

LR 6.3(u) All construction welding is to be performed in accordance with the requirements of the Chapter 13 of the Rules for Materials.

LR 6.3(v) Inspection of all welded construction is to be in accordance with the requirements specified in Chapter 13 of the Rules for Materials.

LR 6.3(w) In addition, the following non-destructive examination is to be carried out on ships to be assigned the class notation '**Chemical tanker**':

- (a) All crossings of butts and seams of cargo tank bulkhead plating joints welded in assembly areas or on the berth.
- (b) Where cargo tank boundary welding is completed in assembly areas or on the berth, a minimum of 10 per cent of the total weld length is to be crack detected.
- (c) Where side and bottom longitudinal framing and longitudinal stiffeners terminate at transverse bulkheads, a minimum of 10 per cent of the bulkhead boundary connections is to be crack detected in addition to the requirement given in (b).
- (d) Where longitudinal framing and longitudinal bulkhead stiffeners are continuous through transverse bulkheads, 30 per cent each of the bottom and shipside boundaries and 20 per cent of the longitudinal bulkhead boundaries are to be crack detected in addition to the requirement given in (b).
- (e) Where transverse framing members are continuous through the cargo tank boundary, a minimum of 10 per cent of boundary connections is to be crack detected.

6.4 The shipper of the cargo is responsible for providing compatibility information to the ship operator and/or master. This must be done in a timely manner before transportation of the product. The cargo shall be compatible with all materials of construction such that:

- .1 no damage to the integrity of the materials of construction is incurred; and/or
- .2 no hazardous, or potential hazardous reaction is created.

6.5 When a product is submitted to IMO for evaluation, and where compatibility of the product with materials referred to in paragraph 6.1 renders special requirements, the BLG Product Data Reporting form shall provide information on the required materials of construction. The requirements shall be reflected in chapter 15 and consequently be referred to in column o of chapter 17. The reporting form shall also indicate if no special requirements are necessary. The producer of the product is responsible for providing the correct information.

Cargo Temperature Control

Chapter 7

Section 1

7.1 General

7.1.1 When provided, any cargo heating or cooling systems shall be constructed, fitted and tested to the satisfaction of the Administration. Materials used in the construction of temperature-control systems shall be suitable for use with the product intended to be carried.

LR 7.1 General

LR 7.1(a) For the carriage of cargoes for which special temperature control is required, as noted in column 'o' in the table of Chapter 17, heating and/or cooling systems complying with the requirements set out hereunder, are to be provided. Where appropriate, notations in the *Register Book* will be assigned as provided for in LR III.2.1.

LR 7.1(b) When temperature control systems installed for operational reasons, such as those intended for maintaining cargoes other than those listed above, at temperatures suitable for the preservation of quality, or at viscosities which facilitate cargo transfer, comply fully with the requirements, they will also be eligible for the class notations given in LR III.2.1.

LR 7.2 Systems

LR 7.2(a) Temperature control systems include the following:

- Active Pipe coils or ducts for circulating a heating or cooling medium within, or adjacent to, the bulk of the cargo.
- or A heat exchanger through which the cargo and a heating or cooling medium is circulated.
- Passive Thermal insulation of tanks intended to maintain a pre-heated or pre-cooled cargo within a specified range of temperatures for a limited period of time without applied heating or cooling.

LR 7.3 Requirements

LR 7.3(a) Capacity

LR 7.3(a).1 Active heating and cooling systems are to have capacity such that the cargo in the designated tanks can be maintained at the carrying temperature under the following conditions:

	Heating systems	Cooling systems
Seawater temperature	0°C	32°C
Air temperature	5°C	45°C

Limiting tank boundary temperatures to be specified.

NOTE: For the purpose of calculation it is to be assumed that the cargo is loaded at the carrying temperature.

LR 7.3(a).2 If capacity in excess of that required to comply with the foregoing is installed for the purpose of heating or cooling cargoes to temperatures different from that at which they are loaded, the distinguishing mark ‡ will be assigned.

LR 7.3(a).3 Passive systems will be examined in respect of suitability for specified cargoes, conditions and voyages, on submission of relevant details.

LR 7.3(a).4 Where cooling systems incorporate mechanical refrigeration, the installation is to comply with the requirements of Pt 6, Ch 3 of the Rules for Ships, so far as they are applicable. Such an installation is not to be used for any other cooling duty.

LR 7.3(b) Stand-by plant

LR 7.3(b).1 Heating and cooling systems are to be duplicated to the following extent:

LR 7.3(b).2 Coil or duct systems are to have not less than two independent circuits per tank. There is to be sufficient capacity for the total required minimum heating or cooling with any one circuit out of action, and the circuits are to be so arranged that the heating or cooling can be evenly distributed throughout the cargo.

LR 7.3(b).3 Deck lines for heating and cooling media need not be duplicated.

LR 7.3(b).4 There are to be two independent sources of heat input. These may be boilers or other devices such as calorifiers or air heaters, each being of sufficient capacity to supply at least the minimum requirement.

LR 7.3(b).5 Heat exchangers (where fitted) are to be duplicated.

LR 7.3(b).6 Circulating pumps for both cargo, and heating or cooling media (where fitted) are to be duplicated. Cargo pumps may be used for cargo circulation if suitable.

LR 7.3(b).7 Refrigeration plant for cargo cooling is to comply with Pt 6, Ch 3.2.2.1 of the Rules for Ships, with regard to stand-by capacity.

LR 7.3(b).8 All duplicate machinery and circuits are to be capable of being isolated without inhibiting the operation of the remainder of the system.

7.1.2 Heating or cooling media shall be of a type approved for use with the specific cargo. Consideration shall be given to the surface temperature of heating coils or ducts to avoid dangerous reactions from localised overheating or overcooling of cargo. (See also 15.13.6).

7.1.3 Heating or cooling systems shall be provided with valves to isolate the system for each tank and to allow manual regulation of flow.

LR 7.3(c) See also 16.6.2.

Cargo Temperature Control

Chapter 7

Sections 1 & 2

7.1.4 In any heating or cooling system, means shall be provided to ensure that, when in any condition other than empty, a higher pressure can be maintained within the system than the maximum pressure head that could be exerted by the cargo tank contents on the system.

7.1.5 Means shall be provided for measuring the cargo temperature.

- .1 The means for measuring the cargo temperature shall be of restricted or closed type, respectively, when a restricted or closed gauging device is required for individual substances as shown in *column j* in the table of chapter 17.
- .2 A restricted temperature-measuring device is subject to the definition for a restricted gauging device in 13.1.1.2 (e.g. a portable thermometer lowered inside a gauge tube of the restricted type).
- .3 A closed temperature-measuring device is subject to the definition for a closed gauging device in 13.1.1.3 (e.g. a remote-reading thermometer of which the sensor is installed in the tank).
- .4 When overheating or overcooling could result in a dangerous condition, an alarm system which monitors the cargo temperature shall be provided. (See also operational requirements in 16.6.)

LR 7.4 Cargo temperature measurement

(Applicable to tanks which are designated for the carriage of temperature-controlled cargoes).

LR 7.4(a) In each integral tank, temperature measuring positions are to be so disposed that a reliable mean cargo temperature can be obtained. Where limiting tank boundary temperatures are specified, means for determining these temperatures are also to be provided.

LR 7.4(b) For the carriage of ammonium nitrate solutions (UN 2426) and hydrogen peroxide (UN 2015) there are to be not less than five measuring points per tank, in well separated positions spanning substantially the full depth and horizontal area of the tank, one of which is to be in the vicinity of the volumetric centroid of the tank.

LR 7.4(c) Similar provision is recommended for all high viscosity and polymerising cargoes.

LR 7.4(d) Where cargoes are carried in integral tanks at temperatures which could influence the properties of the structural steelwork, additional measuring points and alarms may be required.

LR 7.4(e) Independent tanks intended for the carriage of heated or cooled cargoes are to have not less than two measuring points, well separated within the centre 60 per cent of the tank depth.

LR 7.4(f) In tanks of all types, intended for the carriage of heated or cooled cargoes there are to be alternative means of measuring temperatures:

LR 7.4(g) For 'closed' temperature measuring devices, all sensors may be connected to a single indicator/recorder, but a stand-by indicator/recorder with suitable switching arrangements is to be provided. Alternatively, there may be at least two indicator/recorders, each permanently connected to approximately half the sensors in each tank.

LR 7.4(h) Tanks which are adapted primarily to 'restricted' temperature measuring devices are to have at least one 'closed' device per tank which can be read under all sea conditions.

7.1.6 When products for which 15.12, 15.12.1 or 15.12.3 are listed in *column o* in the table of chapter 17 are being heated or cooled, the heating or cooling medium shall operate in a circuit:

- .1 which is independent of other ship's services, except for another cargo heating or cooling system, and which does not enter the machinery space; or
- .2 which is external to the tank carrying toxic products; or
- .3 where the medium is sampled to check for the presence of cargo before it is recirculated to other services of the ship or into the machinery space. The sampling equipment shall be located within the cargo area and be capable of detecting the presence of any toxic cargo being heated or cooled. Where this method is used, the coil return shall be tested not only at the commencement of heating or cooling of a toxic product, but also on the first occasion the coil is used subsequent to having carried an unheated or uncooled toxic cargo.

7.2 Additional requirements

For certain products, additional requirements contained in chapter 15 are shown in *column o* in the table of chapter 17.

Cargo Tank Venting and Gas-Freeing Arrangements

Chapter 8

Sections 1, 2 & 3

8.1 Application

8.1.1 Unless expressly provided otherwise, this chapter applies to ships constructed on or after 1 January 1994.

8.1.2 Ships constructed before 1 January 1994 shall comply with the requirements of chapter 8 of this Code which were in force prior to the said date.

8.1.3 For the purpose of this regulation, the term "ship constructed" is as defined in SOLAS regulation II-1/1.3.1.

8.1.4 Ships constructed on or after 1 July 1986 but before 1 January 1994 which fully comply with the requirements of the Code applicable at that time may be regarded as complying with the requirements of SOLAS regulations II-2/4.5.3, 4.5.6 to 4.5.8, 4.5.10 and 11.6.

8.1.5 For ships to which the Code applies, the requirements of this chapter shall apply in lieu of SOLAS regulations II-2/4.5.3 and 4.5.6.

8.1.6 Ships constructed on or after 1 July 1986 but before 1 July 2002 shall comply with the requirements of paragraph 8.3.3.

8.2 Cargo tank venting

8.2.1 All cargo tanks shall be provided with a venting system appropriate to the cargo being carried and these systems shall be independent of the air pipes and venting systems of all other compartments of the ship. Tank venting systems shall be designed so as to minimise the possibility of cargo vapour accumulating about the decks, entering accommodation, service and machinery spaces and control stations and, in the case of flammable vapours, entering or collecting in spaces or areas containing sources of ignition. Tank venting systems shall be arranged to prevent entrance of water into the cargo tanks and, at the same time, vent outlets shall direct the vapour discharge upwards in the form of unimpeded jets.

8.2.2 The venting systems shall be connected to the top of each cargo tank and as far as practicable the cargo vent lines shall be self-draining back to the cargo tanks under all normal operational conditions of list and trim. Where it is necessary to drain venting systems above the level of any pressure/vacuum valve, capped or plugged drain cocks shall be provided.

8.2.3 Provision shall be made to ensure that the liquid head in any tank does not exceed the design head of the tank. Suitable high-level alarms, overflow control systems or spill valves, together with gauging and tank filling procedures, may be accepted for this purpose. Where the means of limiting cargo tank overpressure includes an automatic closing valve, the valve shall comply with the appropriate provisions of 15.19.

LR 8.2(a) The system for guarding against liquid rising to a height which would exceed the design head of the cargo tanks is to be independent of the gauging devices.

LR 8.2(b) Attention is drawn to the need to comply with any more onerous filling height restrictions imposed by the carriage of high relative density cargoes (i.e., above 1,025).

8.2.4 Tank venting systems shall be designed and operated so as to ensure that neither pressure nor vacuum created in the cargo tanks during loading or unloading exceeds tank design parameters. The main factors to be considered in the sizing of a tank venting system are as follows:

- .1 design loading and unloading rate;
- .2 gas evolution during loading; this shall be taken account of by multiplying the maximum loading rate by a factor of at least 1.25;
- .3 density of the cargo vapour mixture;
- .4 pressure loss in vent piping and across valves and fittings; and
- .5 pressure/vacuum settings of relief devices.

8.2.5 Tank vent piping connected to cargo tanks of corrosion-resistant material, or to tanks which are lined or coated to handle special cargoes as required by the Code, shall be similarly lined or coated or constructed of corrosion-resistant material.

8.2.6 The master shall be provided with the maximum permissible loading and unloading rates for each tank or group of tanks consistent with the design of the venting systems.

8.3 Types of tank venting systems

8.3.1 An open tank venting system is a system which offers no restriction except for friction losses to the free flow of cargo vapours to and from the cargo tanks during normal operations. An open venting system may consist of individual vents from each tank, or such individual vents may be combined into a common header or headers, with due regard to cargo segregation. In no case shall shutoff valves be fitted either to the individual vents or to the header.

8.3.2 A controlled tank venting system is a system in which pressure- and vacuum-relief valves or pressure/vacuum valves are fitted to each tank to limit the pressure or vacuum in the tank. A controlled venting system may consist of individual vents from each tank or such individual vents on the pressure side only as may be combined into a common header or headers, with due regard to cargo segregation. In no case shall shut-off valves be fitted either above or below pressure- or vacuum-relief valves or pressure/vacuum valves. Provision may be made for bypassing a pressure- or vacuum-relief or pressure/vacuum valve under certain operating conditions provided that the requirements of 8.3.6 are maintained and that there is suitable indication to show whether or not the valve is bypassed.

Cargo Tank Venting and Gas-Freeing Arrangements

Chapter 8

Sections 3, 4 & 5

8.3.3 Controlled tank venting systems shall consist of a primary and a secondary means of allowing full flow relief of vapour to prevent over-pressure or under-pressure in the event of failure of one means. Alternatively, the secondary means may consist of pressure sensors fitted in each tank with a monitoring system in the ship's cargo control room or position from which cargo operations are normally carried out. Such monitoring equipment shall also provide an alarm facility which is activated by detection of over-pressure or under-pressure conditions within a tank.

8.3.4 The position of vent outlets of a controlled tank venting system shall be arranged:

- .1 at a height of not less than 6 m above the weather deck or above a raised walkway if fitted within 4 m of the raised walkway; and
- .2 at a distance of at least 10 m measured horizontally from the nearest air intake or opening to accommodation, service and machinery spaces and ignition sources.

8.3.5 The vent outlet height referred to in 8.3.4.1 may be reduced to 3 m above the deck or a raised walkway, as applicable, provided that high-velocity venting valves of an approved type, directing the vapour/air mixture upwards in an unimpeded jet with an exit velocity of at least 30 m/s, are fitted.

8.3.6 Controlled tank venting systems fitted to tanks to be used for cargoes having a flashpoint not exceeding 60°C (closed-cup test) shall be provided with devices to prevent the passage of flame into the cargo tanks. The design, testing and locating of the devices shall comply with the requirements of the Administration, which shall contain at least the standards adopted by the Organization.

8.3.7 In designing venting systems and in the selection of devices to prevent the passage of flame for incorporation into the tank venting system, due attention shall be paid to the possibility of the blockage of these systems and fittings by, for example, the freezing of cargo vapour, polymer build-up, atmospheric dust or icing up in adverse weather conditions. In this context it shall be noted that flame arresters and flame screens are more susceptible to blockage. Provisions shall be made such that the system and fittings may be inspected, operationally checked, cleaned or renewed as applicable.

8.3.8 Reference in 8.3.1 and 8.3.2 to the use of shutoff valves in the venting lines shall be interpreted to extend to all other means of stoppage, including spectacle blanks and blank flanges.

8.4 Venting requirements for individual products

Venting requirements for individual products are shown in *column g*, and additional requirements in *column o* in the table of chapter 17.

8.5 Cargo-tank gas-freeing

8.5.1 The arrangements for gas-freeing cargo tanks used for cargoes other than those for which open venting is permitted shall be such as to minimise the hazards due to the dispersal of flammable or toxic vapours in the atmosphere and to flammable or toxic vapour mixtures in a cargo tank. Accordingly, gas-freeing operations shall be carried out such that vapour is initially discharged:

- .1 through the vent outlets specified in 8.3.4 and 8.3.5; or
- .2 through outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas-freeing operation; or
- .3 through outlets at least 2 m above the cargo tank deck level with a vertical exit velocity of at least 20 m/s which are protected by suitable devices to prevent the passage of flame.

When the flammable vapour concentration at the outlets has been reduced to 30% of the lower flammable limit and, in the case of a toxic product, the vapour concentration does not present a significant health hazard, gas-freeing may thereafter be continued at cargo tank deck level.

8.5.2 The outlets referred to in 8.5.1.2 and 8.5.1.3 may be fixed or portable pipes.

8.5.3 In designing a gas-freeing system in conformity with 8.5.1, particularly in order to achieve the required exit velocities of 8.5.1.2 and 8.5.1.3, due consideration shall be given to the following:

- .1 materials of construction of system;
- .2 time to gas-free;
- .3 flow characteristics of fans to be used;
- .4 the pressure losses created by ducting, piping, cargo tank inlets and outlets;
- .5 the pressure achievable in the fan driving medium (e.g. water or compressed air); and
- .6 the densities of the cargo vapour/air mixtures for the range of cargoes to be carried.

Environmental Control

Chapter 9

Sections 1 & 2

9.1 General

9.1.1 Vapour spaces within cargo tanks and, in some cases, spaces surrounding cargo tanks may require to have specially controlled atmospheres.

LR 9.1(a) For the purposes of inerting, Resolutions A.566(14) and A.567(14), as may be amended, in the IMO publication of 14th Assembly Resolutions, are to be complied with as applicable.

9.1.2 There are four different types of control for cargo tanks, as follows:

- .1 *Inerting*: by filling the cargo tank and associated piping systems and, where specified in chapter 15, the spaces surrounding the cargo tanks, with a gas or vapour which will not support combustion and which will not react with the cargo, and maintaining that condition.
- .2 *Padding*: by filling the cargo tank and associated piping systems with a liquid, gas or vapour which separates the cargo from the air, and maintaining that condition.
- .3 *Drying*: by filling the cargo tank and associated piping systems with moisture-free gas or vapour with a dewpoint of -40°C or below at atmospheric pressure, and maintaining that condition.
- .4 *Ventilation*: forced or natural.

9.1.3 Where inerting or padding of cargo tanks is required:

- .1 An adequate supply of inert gas for use in filling and discharging the cargo tanks shall be carried or shall be manufactured on board unless a shore supply is available. In addition, sufficient inert gas shall be available on the ship to compensate for normal losses during transportation.
- .2 The inert gas system on board the ship shall be able to maintain a pressure of at least 0.007 MPa gauge within the containment system at all times. In addition, the inert gas system shall not raise the cargo tank pressure to more than the tank's relief-valve setting.
- .3 Where padding is used, similar arrangements for supply of the padding medium shall be made as required for inert gas in 9.1.3.1 and 9.1.3.2.
- .4 Means shall be provided for monitoring ullage spaces containing a gas blanket to ensure that the correct atmosphere is being maintained.
- .5 Inerting or padding arrangements or both, where used with flammable cargoes, shall be such as to minimise the creation of static electricity during the admission of the inerting medium.

9.1.4 Where drying is used and dry nitrogen is used as the medium, similar arrangements for supply of the drying agent shall be made to those required in 9.1.3. Where drying agents are used as the drying medium on all air inlets to the tank, sufficient medium shall be carried for the duration of the voyage, taking into consideration the diurnal temperature range and the expected humidity.

9.2 Environmental control requirements for individual products

The required types of environmental control for certain products are shown in *column h* in the table of chapter 17.

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Electrical Installations

Chapter 10

Sections 1, 2 & 3

10.1 General

LR 10.1(a) The requirements of this Chapter are additional to those of Pt 6, Ch 2 of the Rules for Ships.

LR 10.1(b) In cases where LR is authorised to issue the relevant statutory certificates, and is required to do so, the requirements of this Chapter, including LR's interpretations where relevant and the requirements of Pt 6, Ch 2 of the Rules for Ships will be applied together with any amendment or interpretation adopted by the appropriate National Authority.

10.1.1 The provisions of this chapter are applicable to ships carrying cargoes which are inherently, or due to their reaction with other substances, flammable or corrosive to the electrical equipment, and shall be applied in conjunction with applicable electrical requirements of part D of chapter II-1 of SOLAS.

10.1.2.1 Electrical installations shall be such as to minimise the risk of fire and explosion from flammable products*.

LR 10.1(c) Where electrical equipment is to be of a 'safe type' in order to comply with IEC 60092 : *Electrical installations in ships – Part 502: Tankers – Special features*, such equipment is to be certified for the gases/vapours involved. The construction and type testing is to be in accordance with IEC Publication 60079:., *Electrical Apparatus for Explosive Gas Atmospheres*, or an equivalent National Standard.

10.1.2.2 Where the specific cargo is liable to damage the materials normally used in electrical apparatus, due consideration shall be given to the particular characteristics of the materials chosen for conductors, insulation, metal parts, etc. As far as necessary, these components shall be protected to prevent contact with gases or vapours liable to be encountered.

10.1.3 The Administration shall take appropriate steps to ensure uniformity in the implementation and the application of the provisions of this chapter in respect of electrical installations.

10.1.4 Electrical equipment, cables and wiring shall not be installed in the hazardous locations unless it conforms with the standards not inferior to those acceptable to the Organization*. However for locations not covered by such standards, electrical equipment, cables and wiring which do not conform to the standards may be installed in hazardous locations based on a risk assessment to the satisfaction of the Administration, to ensure that an equivalent level of safety is assured.

LR 10.1(d) Absence of information on temperature class and apparatus group in column *i* in the Table of Chapter 17 means that data are not currently available, and this should not be confused with the non-flammable (NF) notation describing some substances. For those cargoes where there is absence of information on temperature class and apparatus group in Chapter 17, this information is to be submitted where carriage is contemplated.

10.1.5 Where electrical equipment is installed in hazardous locations, as permitted in this chapter, it shall be to the satisfaction of the Administration and certified by the relevant authorities recognised by the Administration for operation in the flammable atmosphere concerned, as indicated in column *i* in the table of chapter 17.

10.1.6 For guidance, indication is given if the flashpoint of a substance is in excess of 60°C. In the case of a heated cargo, carriage conditions might need to be established and the requirements for cargoes having a flashpoint not exceeding 60°C applied.

LR 10.1(e) The emergency source of electrical power is also to remain operable under the conditions described in Ch 2.2.9 Survival requirements.

10.2 Bonding

Independent cargo tanks shall be electrically bonded to the hull. All gasketed cargo-pipe joints and hose connections shall be electrically bonded.

10.3 Electrical requirements for individual products

Electrical requirements for individual products are shown in column *i* in the table of chapter 17.

LR 10.3(a) For chlorosulphonic acid, hydrochloric acid, nitric acid, oleum, phosphoric acid, sulphuric acid and trimethylacetic acid, the hazardous areas identified in IEC 60092 *Electrical installations in ships – Part 502: Tankers – Special features*, 4.5 *Tankers carrying cargoes (for example acids) reacting with other products/materials to evolve flammable gases* are applicable. The relevant gas group and temperature class are IIC T1.

LR 10.3(b) For sulphur liquid, the hazardous areas identified in IEC 60092 *Electrical installations in ships – Part 502: Tankers – Special features*, 4.3 *Tankers carrying flammable liquids having a flashpoint exceeding 60°C* are applicable. The relevant gas group and temperature class are IIB T3.

* Reference is made to the recommendations published by the International Electrotechnical Commission, in particular to Publication IEC 60079-1-1: 2002.

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Fire Protection and Fire Extinction

Chapter 11

Sections 1, 2 & 3

11.1 Application

11.1.1 The requirements for tankers in SOLAS chapter II-2 shall apply to ships covered by the Code, irrespective of tonnage, including ships of less than 500 tons gross tonnage, except that:

- .1 regulations 4.5.5, 10.8 and 10.9 shall not apply;
- .2 regulation 4.5.1.2 (i.e. the requirements for location of the main cargo control station), need not apply;
- .3 regulations 10.2, 10.4, and 10.5 shall apply as they would apply to cargo ships of 2,000 tons gross tonnage and over;
- .4 regulation 10.5.6 shall apply to ships of 2,000 gross tonnage and over;
- .5 the provisions of 11.3 shall apply in lieu of regulation 10.8;
- .6 the provisions of 11.2 shall apply in lieu of regulation 10.9;
- .7 regulation 4.5.10 shall apply to ships of 500 gross tonnage and over, replacing "hydrocarbon gases" by "flammable vapours" in the regulation; and
- .8 regulations 13.3.4 and 13.4.3 shall apply to ships of 500 gross tonnage and over.

11.1.2 Notwithstanding the provisions of 11.1.1, ships engaged solely in the carriage of products which are non-flammable (entry NF in *column i* of the table of minimum requirements) need not comply with requirements for tankers specified in SOLAS chapter II-2, provided that they comply with the requirements for cargo ships of that chapter, except that regulation 10.7 need not apply to such ships and 11.2 and 11.3, hereunder, need not apply.

11.1.3 For ships engaged solely in the carriage of products with flashpoint of 60°C and above (entry 'Yes' in *column i* of the table of minimum requirements), the requirements of SOLAS chapter II-2 may apply as specified in regulation II-2/1.6.4 in lieu of the provisions of this chapter.

11.1.4 In lieu of the provisions of SOLAS regulation II-2/1.6.7, the requirements of regulations II-2/4.5.10.1.1 and II-2/4.5.10.1.4 shall apply and a system for continuous monitoring of the concentration of flammable vapours shall be fitted on ships of 500 gross tonnage and over which were constructed before 1 January 2009 by the date of the first scheduled dry-docking after 1 January 2009, but not later than 1 January 2012. Sampling points or detector heads should be located in suitable positions in order that potentially dangerous leakages are readily detected. When the flammable vapour concentration reaches a pre-set level which shall not be higher than 10% of the lower flammable limit, a continuous audible and visual alarm signal shall be automatically effected in the pump-room and cargo control room to alert personnel to the potential hazard. However, existing monitoring systems already fitted having a pre-set level not greater than 30% of the lower flammable limit may be accepted. Notwithstanding the above provisions, the Administration may exempt ships not engaged on international voyages from those requirements.

LR 11.1(a) These requirements for fire protection and fire extinction are not part of the Classification Rules. However, compliance with the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* (IBC), being a requirement of the 1983 Amendments to the *International Convention for the Safety of Life at Sea 1974*, is a prerequisite of Classification. See Pt 1, Ch 2, 1.1.9. This is to be demonstrated by possession of an International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk issued by a National Authority or by LR when so authorised. When issued by LR, the requirements of this Chapter will be applied together with any interpretation of the requirements specified by the appropriate National Authority. When issued by the National Authority, the requirements of this Chapter will be the sole prerogative of the National Authority and will not be applied directly by LR for Classification purposes. See also LR II.1.4 and LR II.2.

LR 11.1(b) References in 11.1 and 11.2 to Chapter II-2 of the 1983 SOLAS amendments should be further referred to Chapter II-2 of the consolidated text of the 1974 SOLAS Convention.

11.2 Cargo pump-rooms

11.2.1 The cargo pump-room of any ship shall be provided with a fixed carbon dioxide fire-extinguishing system as specified in SOLAS regulation II-2/10.9.1.1. A notice shall be exhibited at the controls stating that the system is only to be used for fire-extinguishing and not for inerting purposes, due to the electrostatic ignition hazard. The alarms referred to in SOLAS II-2/10.9.1.1.1 shall be safe for use in a flammable cargo vapour/air mixture. For the purpose of this requirement, an extinguishing system shall be provided which would be suitable for machinery spaces. However, the amount of gas carried shall be sufficient to provide a quantity of free gas equal to 45% of the gross volume of the cargo pump-room in all cases.

11.2.2 Cargo pump-rooms of ships which are dedicated to the carriage of a restricted number of cargoes shall be protected by an appropriate fire-extinguishing system approved by the Administration.

11.2.3 If cargoes are to be carried which are not suited to extinguishment by carbon dioxide or equivalent media, the cargo pump-room shall be protected by a fire extinguishing system consisting of either a fixed pressure water spray or high expansion foam system. The International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk shall reflect this conditional requirement.

11.3 Cargo area

11.3.1 Every ship should be provided with a fixed deck foam system in accordance with the requirements of 11.3.2 to 11.3.12.

Fire Protection and Fire Extinction

Chapter 11

Sections 3 & 4

11.3.2 Only one type of foam concentrate shall be supplied, and it shall be effective for the maximum possible number of cargoes intended to be carried. For other cargoes for which foam is not effective or is incompatible, additional arrangements to the satisfaction of the Administration shall be provided. Regular protein foam shall not be used.

11.3.3 The arrangements for providing foam shall be capable of delivering foam to the entire cargo tanks deck area as well as into any cargo tank, the deck of which is assumed to be ruptured.

11.3.4 The deck foam system shall be capable of simple and rapid operation. The main control station for the system shall be suitably located outside of the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fires in the areas protected.

11.3.5 The rate of supply of foam solution shall not be less than the greatest of the following:

- .1 2 l/min per square metre of the cargo tanks deck area, where cargo tanks deck area means the maximum breadth of the ship times the total longitudinal extent of the cargo tank spaces;
- .2 20 l/min per square metre of the horizontal sectional area of the single tank having the largest such area;
- .3 10 l/min per square metre of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1,250 l/min. For ships of less than 4,000 tonnes deadweight, the minimum capacity of the monitor shall be to the satisfaction of the Administration.

11.3.6 Sufficient foam concentrate shall be supplied to ensure at least 30 min of foam generation when using the highest of the solution rates stipulated in 11.3.5.1, 11.3.5.2 and 11.3.5.3.

11.3.7 Foam from the fixed foam system shall be supplied by means of monitors and foam applicators. At least 50% of the foam rate required in 11.3.5.1 or 11.3.5.2 shall be delivered from each monitor. The capacity of any monitor shall be at least 10 l/min of foam solution per square metre of deck area protected by that monitor, such area being entirely forward of the monitor. Such capacity shall be not less than 1,250 l/min. For ships of less than 4,000 tonnes deadweight, the minimum capacity of the monitor shall be to the satisfaction of the Administration.

11.3.8 The distance from the monitor to the farthest extremity of the protected area forward of that monitor shall be not more than 75% of the monitor throw in still air conditions.

11.3.9 A monitor and hose connection for a foam applicator shall be situated both port and starboard at the poop front or accommodation spaces facing the cargo area.

11.3.10 Applicators shall be provided for flexibility of action during fire-fighting operations and to cover areas screened from the monitors. The capacity of any applicator shall be not less than 400 l/min and the applicator throw in still air conditions shall be not less than 15 m. The number of foam applicators provided shall be not less than four. The number and disposition of foam main outlets shall be such that foam from at least two applicators can be directed to any part of the cargo tanks deck area.

11.3.11 Valves shall be provided in the foam main, and in the fire main where this is an integral part of the deck foam system, immediately forward of any monitor position to isolate damaged sections of those mains.

11.3.12 Operation of a deck foam system at its required output shall permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.

11.3.13 Ships which are dedicated to the carriage of a restricted number of cargoes shall be protected by alternative provisions to the satisfaction of the Administration when they are just as effective for the products concerned as the deck foam system required for the generality of flammable cargoes.

11.3.14 Suitable portable fire-extinguishing equipment for the products to be carried shall be provided and kept in good operating order.

11.3.15 Where flammable cargoes are to be carried, all sources of ignition shall be excluded from hazardous locations unless such sources conform with 10.1.4.

11.3.16 Ships fitted with bow or stern loading and unloading arrangements shall be provided with one additional foam monitor meeting the requirements of 11.3.7 and one additional applicator meeting the requirements of 11.3.10. The additional monitor shall be located to protect the bow or stern loading and unloading arrangements. The area of the cargo line forward or aft of the cargo area shall be protected by the above-mentioned applicator.

11.4 Special requirements

Fire-extinguishing media determined to be effective for each product are listed for information in *column I* in the table of chapter 17.

Mechanical Ventilation in the Cargo Area

Chapter 12

Sections 1, 2 & 3

For ships to which the Code applies, the requirements of this chapter replace the requirements of SOLAS regulations II-2/4.5.2.6 and 4.5.4.

However, for products addressed under paragraphs 11.1.2 and 11.1.3, except acids and products for which paragraph 15.17 applies, SOLAS regulations II-2/4.5.2.6 and 4.5.4 may apply in lieu of the provisions of this chapter.

12.1 Spaces normally entered during cargo-handling operations

12.1.1 Cargo pump-rooms and other enclosed spaces which contain cargo-handling equipment and similar spaces in which work is performed on the cargo shall be fitted with mechanical ventilation systems, capable of being controlled from outside such spaces.

12.1.2 Provision shall be made to ventilate such spaces prior to entering the compartment and operating the equipment and a warning notice requiring the use of such ventilation shall be placed outside the compartment.

12.1.3 Mechanical ventilation inlets and outlets shall be arranged to ensure sufficient air movement through the space to avoid the accumulation of toxic or flammable vapours or both (taking into account their vapour densities) and to ensure sufficient oxygen to provide a safe working environment, but in no case shall the ventilation system have a capacity of less than 30 changes of air per hour, based upon the total volume of the space. For certain products, increased ventilation rates for cargo pump-rooms are prescribed in 15.17.

12.1.4 Ventilation systems shall be permanent and shall normally be of the extraction type. Extraction from above and below the floor plates shall be possible. In rooms housing motors driving cargo pumps, the ventilation shall be of the positive-pressure type.

12.1.5 Ventilation exhaust ducts from spaces within the cargo area shall discharge upwards in locations at least 10 m in the horizontal direction from ventilation intakes and openings to accommodation, service and machinery spaces and control stations and other spaces outside the cargo area.

12.1.6 Ventilation intakes shall be so arranged as to minimise the possibility of recycling hazardous vapours from any ventilation discharge opening.

12.1.7 Ventilation ducts shall not be led through accommodation, service and machinery spaces or other similar spaces.

12.1.8 Electric motors driving fans shall be placed outside the ventilation ducts if the carriage of flammable products is intended. Ventilation fans and fan ducts, in way of fans only, for hazardous locations referred to in chapter 10 shall be of non-sparking construction, defined as:

- .1 impellers or housing of non-metallic construction, due regard being paid to the elimination of static electricity;

- .2 impellers and housing of non-ferrous materials;
- .3 impellers and housing of austenitic stainless steel; and
- .4 ferrous impellers and housing with not less than 13 mm design tip clearance.

Any combination of an aluminium or magnesium alloy fixed or rotating component and a ferrous fixed or rotating component, regardless of tip clearance, is considered a sparking hazard and shall not be used in these places.

12.1.9 Sufficient spare parts shall be carried for each type of fan on board required by this chapter.

12.1.10 Protection screens of not more than 13 mm square mesh shall be fitted in outside openings of ventilation ducts.

12.2 Pump-rooms and other enclosed spaces normally entered

Pump-rooms and other enclosed spaces normally entered which are not covered by 12.1.1 shall be fitted with mechanical ventilation systems, capable of being controlled from outside such spaces and complying with the requirements of 12.1.3, except that the capacity shall not be less than 20 changes of air per hour, based upon the total volume of the space. Provision shall be made to ventilate such spaces prior to personnel entering.

12.3 Spaces not normally entered

Double bottoms, cofferdams, duct keels, pipe tunnels, hold spaces and other spaces where cargo may accumulate shall be capable of being ventilated to ensure a safe environment when entry into the spaces is necessary. Where a permanent ventilation system is not provided for such spaces, approved means of portable mechanical ventilation shall be provided. Where necessary, owing to the arrangement of spaces, for instance hold spaces, essential ducting for ventilation shall be permanently installed. For permanent installations the capacity of eight air changes per hour shall be provided and for portable systems the capacity of 16 air changes per hour. Fans or blowers shall be clear of personnel access openings, and shall comply with 12.1.8.

LR 12.3(a) Particulars of the type and number of portable fans, their arrangement and means of attachment are to be submitted for consideration in relation to the internal and external arrangement of the space concerned.

LR 12.3(b) Increased ventilation will be required for spaces which contain gas-freeing systems, unless these systems are totally enclosed.

LR 12.3(c) Ventilation systems are to be capable of use prior to entry and during occupation.

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Instrumentation

Chapter 13

Sections 1 & 2

13.1 Gauging

13.1.1 Cargo tanks shall be fitted with one of the following types of gauging devices:

- .1 *Open device*: which makes use of an opening in the tanks and may expose the gauger to the cargo or its vapour. An example of this is the ullage opening.
- .2 *Restricted device*: which penetrates the tank and which, when in use, permits a small quantity of cargo vapour or liquid to be exposed to the atmosphere. When not in use, the device is completely closed. The design should ensure that no dangerous escape of tank contents (liquid or spray) can take place in opening the device.
- .3 *Closed device*: which penetrates the tank, but which is part of a closed system and keeps tank contents from being released. Examples are the float-type systems, electronic probe, magnetic probe and protected sight-glass. Alternatively, an indirect device which does not penetrate the tank shell and which is independent of the tank may be used. Examples are weighing of cargo, pipe flow meter.

13.1.2 Gauging devices should be independent of the equipment required under 15.19.

13.1.3 Open gauging and restricted gauging should be allowed only where:

- .1 open venting is allowed by the Code; or
- .2 means are provided for relieving tank pressure before the gauge is operated.

13.1.4 Types of gauging for individual products are shown in *column j* in the table of chapter 17.

13.2 Vapour detection

13.2.1 Ships carrying toxic or flammable products or both should be equipped with at least two instruments designed and calibrated for testing for the specific vapours in question. If such instruments are not capable of testing for both toxic concentrations and flammable concentrations, then two separate sets of instruments shall be provided.

13.2.2 Vapour-detection instruments may be portable or fixed. If a fixed system is installed, at least one portable instrument shall be provided.

13.2.3 When toxic-vapour-detection equipment is not available for some products which require such detection, as indicated in *column k* in the table of chapter 17, the Administration may exempt the ship from the requirement, provided an appropriate entry is made on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk. When granting such an exemption, the Administration shall recognise the necessity for additional breathing-air supply and an entry shall be made on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk drawing attention to the provisions of 14.2.4 and 16.4.2.2.

LR 13.2(a) Where LR is not authorised to issue an International Certificate of Fitness, the necessity for additional breathing-air supply will be specially considered.

13.2.4 Vapour-detection requirements for individual products are shown in *column k* in the table of chapter 17.

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Personnel Protection

Chapter 14

Sections 1, 2 & 3

14.1 Protective equipment

14.1.1 For the protection of crew members who are engaged in loading and discharging operations, the ship shall have on board suitable protective equipment consisting of large aprons, special gloves with long sleeves, suitable footwear, coveralls of chemical-resistant material, and tight-fitting goggles or face shields or both. The protective clothing and equipment shall cover all skin so that no part of the body is unprotected.

14.1.2 Work clothes and protective equipment shall be kept in easily accessible places and in special lockers. Such equipment shall not be kept within accommodation spaces, with the exception of new, unused equipment and equipment which has not been used since undergoing a thorough cleaning process. The Administration may, however, approve storage rooms for such equipment within accommodation spaces if adequately segregated from living spaces such as cabins, passageways, dining rooms, bathrooms, etc.

14.1.3 Protective equipment should be used in any operation which may entail danger to personnel.

14.2 Safety equipment

14.2.1 Ships carrying cargoes for which 15.12, 15.12.1 or 15.12.3 is listed in *column o* in the table of chapter 17 shall have on board sufficient but not less than three complete sets of safety equipment, each permitting personnel to enter a gas-filled compartment and perform work there for at least 20 min. Such equipment shall be in addition to that required by SOLAS regulation II-2/10.10.

14.2.2 One complete set of safety equipment shall consist of:

- .1 one self-contained air-breathing apparatus (not using stored oxygen);
- .2 protective clothing, boots, gloves and tight-fitting goggles;
- .3 fireproof lifeline with belt resistant to the cargoes carried; and
- .4 explosion-proof lamp.

14.2.3 For the safety equipment required in 14.2.1, all ships shall carry either:

- .1 one set of fully charged spare air bottles for each breathing apparatus;
- .2 a special air compressor suitable for the supply of high-pressure air of the required purity;
- .3 a charging manifold capable of dealing with sufficient spare air bottles for the breathing apparatus; or
- .4 fully charged spare air bottles with a total free air capacity of at least 6,000l for each breathing apparatus on board in excess of the requirements of SOLAS regulation II-2/10.10.

14.2.4 A cargo pump-room on ships carrying cargoes which are subject to the requirements of 15.18 or cargoes for which in *column k* in the table of chapter 17 toxic-vapour-detection equipment is required but is not available shall have either:

- .1 a low-pressure line system with hose connections suitable for use with the breathing apparatus required by 14.2.1. This system shall provide sufficient high-pressure air capacity to supply, through pressure-reduction devices, enough low-pressure air to enable two men to work in a gas-dangerous space for at least 1 h without using the air bottles of the breathing apparatus. Means shall be provided for recharging the fixed air bottles and the breathing apparatus air bottles from a special air compressor suitable for the supply of high-pressure air of the required purity; or
- .2 an equivalent quantity of spare bottled air in lieu of the low-pressure air line.

14.2.5 At least one set of safety equipment as required by 14.2.2 shall be kept in a suitable clearly marked locker in a readily accessible place near the cargo pump-room. The other sets of safety equipment shall also be kept in suitable, clearly marked, easily accessible places.

14.2.6 The breathing apparatus shall be inspected at least once a month by a responsible officer, and the inspection recorded in the ship's log-book. The equipment shall be inspected and tested by an expert at least once a year.

14.3 Emergency equipment

14.3.1 Ships carrying cargoes, for which "Yes" is indicated in *column n* of chapter 17, shall be provided with suitable respiratory and eye protection sufficient for every person on board for emergency escape purposes, subject to the following:

- .1 filter-type respiratory protection is unacceptable;
- .2 self-contained breathing apparatus shall have normally at least a duration of service of 15 min;
- .3 emergency escape respiratory protection shall not be used for fire-fighting or cargo-handling purposes and shall be marked to that effect.

14.3.2 The ship shall have on board medical first-aid equipment, including oxygen resuscitation equipment and antidotes for cargoes to be carried, based on the guidelines developed by the Organization*.

14.3.3 A stretcher which is suitable for hoisting an injured person up from spaces such as the cargo pump-room shall be placed in a readily accessible location.

14.3.4 Suitably marked decontamination showers and an eyewash shall be available on deck in convenient locations. The showers and eyewash shall be operable in all ambient conditions.

* Reference is made to the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG), which provides advice on the treatment of casualties in accordance with the symptoms exhibited as well as equipment and antidotes that may be appropriate for treating the casualty.

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Special Requirements

Chapter 15

Sections 1, 2 & 3

15.1 General

15.1.1 The provisions of this chapter are applicable where specific reference is made in *column o* in the table of chapter 17. These requirements are additional to the general requirements of the Code.

LR 15.1(a) For cargoes dealt with in this Chapter, the hazards are such that the integrity of the containment system and operational safety procedures are of paramount importance. Attention is drawn to possible National Authority and Port Administration requirements for dealing with emergencies involving the cargo concerned.

15.2 Ammonium nitrate solution (93% or less)

15.2.1 The ammonium nitrate solution shall contain at least 7% by weight of water. The acidity (pH) of the cargo when diluted with ten parts of water to one part of cargo by weight shall be between 5.0 and 7.0. The solution shall not contain more than 10 ppm chloride ions, 10 ppm ferric ions, and shall be free of other contaminants.

LR 15.2(a) The liquid is to be carried in independent, externally insulated tanks which are so supported and keyed as to permit free expansion in all directions and eliminate heat bridges which may transmit thermal stresses to the hull. The tanks are to be constructed of stainless steel taking into account the dynamic loading which will be experienced by the tanks, supports and keys in service. Calculations are to be submitted.

15.2.2 Tanks and equipment for ammonium nitrate solution shall be independent of tanks and equipment containing other cargoes or combustible products. Equipment which may, in service or when defective, release combustible products into the cargo (e.g. lubricants), shall not be used. Tanks shall not be used for seawater ballast.

LR 15.2(b) The hull arrangements may require to incorporate two longitudinal bulkheads for strength reasons in view of the relative density of ammonium nitrate solutions.

15.2.3 Except where expressly approved by the Administration, ammonium nitrate solutions shall not be transported in tanks which have previously contained other cargoes unless tanks and associated equipment have been cleaned to the satisfaction of the Administration.

15.2.4 The temperature of the heat-exchanging medium in the tank heating system shall not exceed 160°C. The heating system shall be provided with a control system to keep the cargo at a bulk mean temperature of 140°C. High-temperature alarms at 145°C and 150°C and a low-temperature alarm at 125°C shall be provided. Where the temperature of the heat exchanging medium exceeds 160°C, an alarm shall also be given. Temperature alarms and controls shall be located on the navigating bridge.

15.2.5 If the bulk mean cargo temperature reaches 145°C, a cargo sample shall be diluted with ten parts of distilled or demineralised water to one part of cargo by weight and the pH shall be determined by means of a narrow-range indicator paper or stick. Acidity measurements shall then be taken every 24 hours. If the pH is found to be below 4.2, ammonia gas shall be injected into the cargo until the pH of 5.0 is reached.

15.2.6 A fixed installation shall be provided to inject ammonia gas into the cargo. Controls for this system shall be located on the navigation bridge. For this purpose, 300 kg of ammonia per 1,000 tonnes of ammonium nitrate solution shall be available on board.

15.2.7 Cargo pumps shall be of the centrifugal deepwell type or of the centrifugal type with water-flushed seals.

15.2.8 Vent piping shall be fitted with approved weatherhoods to prevent clogging. Such weatherhoods shall be accessible for inspection and cleaning.

15.2.9 Hot work on tanks, piping and equipment which have been in contact with ammonium nitrate solution shall only be done after all traces of ammonium nitrate have been removed, inside as well as outside.

15.3 Carbon disulphide

Carbon disulphide may be carried either under a water pad or under a suitable inert gas pad as specified in the following paragraphs.

Carriage under water pad

15.3.1 Provision shall be made to maintain a water pad in the cargo tank during loading, unloading and transit. In addition, an inert-gas pad shall be maintained in the ullage space during transit.

15.3.2 All openings shall be in the top of the tank, above the deck.

15.3.3 Loading lines shall terminate near the bottom of the tank.

15.3.4 A standard ullage opening shall be provided for emergency sounding.

15.3.5 Cargo piping and vent lines shall be independent of piping and vent lines used for other cargo.

15.3.6 Pumps may be used for discharging cargo, provided they are of the deepwell or hydraulically driven submersible types. The means of driving a deepwell pump shall not present a source of ignition for carbon disulphide and shall not employ equipment that may exceed a temperature of 80°C.

15.3.7 If a cargo discharge pump is used, it shall be inserted through a cylindrical well extending from the tank top to a point near the tank bottom. A water pad shall be formed in this well before attempting pump removal unless the tank has been certified as gas-free.

Special Requirements

Chapter 15

Section 3

15.3.8 Water or inert-gas displacement may be used for discharging cargo, provided the cargo system is designed for the expected pressure and temperature.

15.3.9 Safety relief valves shall be of stainless steel construction.

15.3.10 Because of its low ignition temperature and close clearances required to arrest its flame propagation, only intrinsically safe systems and circuits are permitted in the hazardous locations.

Carriage under suitable inert gas pad

15.3.11 Carbon disulphide shall be carried in independent tanks with a design pressure of not less than 0.06 MPa gauge.

15.3.12 All openings shall be located on the top of the tank, above the deck.

15.3.13 Gaskets used in the containment system shall be of a material which does not react with, or dissolve in, carbon disulphide.

15.3.14 Threaded joints shall not be permitted in the cargo containment system, including the vapour lines.

15.3.15 Prior to loading, the tank(s) shall be inerted with suitable inert gas until the oxygen level is 2% by volume or lower. Means shall be provided to automatically maintain a positive pressure in the tank using suitable inert gas during loading, transport and discharge. The system shall be able to maintain this positive pressure between 0.01 and 0.02 MPa gauge, and shall be remotely monitored and fitted with over/underpressure alarms.

15.3.16 Hold spaces surrounding an independent tank carrying carbon disulphide shall be inerted by a suitable inert gas until the oxygen level is 2% or less. Means shall be provided to monitor and maintain this condition throughout the voyage. Means shall also be provided to sample these spaces for carbon disulphide vapour.

15.3.17 Carbon disulphide shall be loaded, transported and discharged in such a manner that venting to the atmosphere does not occur. If carbon disulphide vapour is returned to shore during loading or to the ship during discharge, the vapour return system shall be independent of all other containment systems.

15.3.18 Carbon disulphide shall be discharged only by submerged deepwell pumps or by a suitable inert gas displacement. The submerged deepwell pumps shall be operated in a way that prevents heat build-up in the pump. The pump shall also be equipped with a temperature sensor in the pump housing with remote readout and alarm in the cargo control room. The alarm shall be set at 80°C. The pump shall also be fitted with an automatic shut-down device to be activated if the tank pressure falls below atmospheric pressure during the discharge.

15.3.19 Air shall not be allowed to enter the cargo tank, cargo pump or lines while carbon disulphide is contained in the system.

15.3.20 No other cargo handling, tank cleaning or deballasting shall take place concurrent with loading or discharge of carbon disulphide.

15.3.21 A water spray system of sufficient capacity shall be provided to blanket effectively the area surrounding the loading manifold, the exposed deck piping associated with product handling and the tank domes. The arrangement of piping and nozzles shall be such as to give a uniform distribution rate of 10 l/m²/min. Remote manual operation shall be arranged such that remote starting of pumps supplying the water-spray system and remote operation of any normally closed valves in the system can be carried out from a suitable location outside the cargo area adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected. The water-spray system shall be capable of both local and remote manual operation, and the arrangement shall ensure that any spilled cargo is washed away. Additionally, a water hose with pressure to the nozzle when atmospheric temperature permits, shall be connected ready for immediate use during loading and unloading operations.

15.3.22 No cargo tanks shall be more than 98% liquid-full at the reference temperature (*R*).

15.3.23 The maximum volume (*V_L*) of cargo to be loaded in a tank shall be:

$$V_L = 0,98 V \frac{\rho_R}{\rho_L}$$

where:

- V* = volume of the tank
- ρ_R* = relative density of cargo at the reference temperature, (*R*)
- ρ_L* = relative density of cargo at the loading temperature
- R* = reference temperature

15.3.24 The maximum allowable tank filling limits for each cargo tank shall be indicated for each loading temperature which may be applied, and for the applicable maximum reference temperature, on a list approved by the Administration. A copy of the list shall be permanently kept on board by the master.

15.3.25 Zones on open deck, or semi-enclosed spaces on open deck within three metres of a tank outlet, gas or vapour outlet, cargo pipe flange or cargo valve of a tank certified to carry carbon disulphide, shall comply with the electrical equipment requirements specified for carbon disulphide in *column i*, chapter 17. Also, within the specified zone, no other heat sources, like steam piping with surface temperatures in excess of 80°C shall be allowed.

15.3.26 Means shall be provided to ullage and sample the cargo without opening the tank or disturbing the positive suitable inert gas blanket.

Special Requirements

Chapter 15

Sections 3, 4 & 5

15.3.27 The product shall be transported only in accordance with a cargo handling plan that has been approved by the Administration. Cargo handling plans shall show the entire cargo piping system. A copy of the approved cargo handling plan shall be available on board. The International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk shall be endorsed to include reference to the approved cargo handling plan.

15.4 Diethyl ether

LR 15.4(a) These requirements also apply to vinyl ethyl ether.

15.4.1 Unless inerted, natural ventilation shall be provided for the voids around the cargo tanks while the vessel is under way. If a mechanical ventilation system is installed, all blowers shall be of non-sparking construction. Mechanical ventilation equipment shall not be located in the void spaces surrounding the cargo tanks.

15.4.2 Pressure-relief-valve settings shall not be less than 0.02 MPa gauge for gravity tanks.

15.4.3 Inert-gas displacement may be used for discharging cargo from pressure tanks provided the cargo system is designed for the expected pressure.

15.4.4 In view of the fire hazard, provision shall be made to avoid any ignition source or heat generation or both in the cargo area.

15.4.5 Pumps may be used for discharging cargo, provided that they are of a type designed to avoid liquid pressure against the shaft gland or are of a hydraulically operated submerged type and are suitable for use with the cargo.

15.4.6 Provision shall be made to maintain the inert-gas pad in the cargo tank during loading, unloading and transit.

15.5 Hydrogen peroxide solutions

15.5.1 *Hydrogen peroxide solutions over 60% but not over 70% by mass.*

15.5.1.1 Hydrogen peroxide solutions over 60% but not over 70% by mass shall be carried in dedicated ships only and no other cargoes shall be carried.

LR 15.5(a) The cargo is to be carried in tanks which are separate from the main hull structure, and which are free of internal supporting members and major structural irregularities.

LR 15.5(b) All openings are to be in the top of the tank and extended above the deck.

LR 15.5(c) For approval purposes, consideration will be given to the need for suitable tests to be undertaken in order to simulate the intended transportation conditions and duration of voyage.

LR 15.5(d) Proposals which involve partial filling of cargo tanks will receive individual consideration.

15.5.1.2 Cargo tanks and associated equipment shall be either pure aluminium (99.5%) or solid stainless steel (304L, 316, 316L or 316Ti), and passivated in accordance with approved procedures. Aluminium shall not be used for piping on deck. All nonmetallic materials of construction for the containment system shall neither be attacked by hydrogen peroxide nor contribute to its decomposition.

LR 15.5(e) Full details of the passivation procedures are to be submitted.

15.5.1.3 Pump-rooms shall not be used for cargo-transfer operations.

15.5.1.4 Cargo tanks shall be separated by cofferdams from oil fuel tanks or any other space containing flammable or combustible materials.

15.5.1.5 Tanks intended for the carriage of hydrogen peroxide shall not be used for seawater ballast.

15.5.1.6 Temperature sensors shall be installed at the top and bottom of the tank. Remote temperature readouts and continuous monitoring shall be located on the navigating bridge. If the temperature in the tanks rises above 35°C, visible and audible alarms shall be activated on the navigating bridge.

LR 15.5(f) Leakages are to be dealt with to LR's satisfaction prior to loading a subsequent hydrogen peroxide cargo.

15.5.1.7 Fixed oxygen monitors (or gas-sampling lines) shall be provided in void spaces adjacent to tanks to detect leakage of the cargo into these spaces. Remote readouts, continuous monitoring (if gas-sampling lines are used, intermittent sampling is satisfactory) and visible and audible alarms similar to those for the temperature sensors shall also be located on the navigating bridge. The visible and audible alarms shall be activated if the oxygen concentration in these void spaces exceeds 30% by volume. Two portable oxygen monitors shall also be available as back-up systems.

LR 15.5(g) Since hydrogen peroxide is not a heated cargo, heating systems should not, in general, be arranged within cargo tanks. Where heating systems are fitted, these are also to be provided with leakage detection arrangements.

15.5.1.8 As a safeguard against uncontrolled decomposition, a cargo-jettisoning system shall be installed to discharge the cargo overboard. The cargo shall be jettisoned if the temperature rise of the cargo exceeds a rate of 2°C per hour over a 5-hour period or when the temperature in the tank exceeds 40°C.

Special Requirements

Chapter 15

Section 5

15.5.1.9 Cargo tank venting systems shall have pressure/vacuum-relief valves for normal controlled venting, and rupture discs or a similar device for emergency venting, should tank pressure rise rapidly as a result of uncontrolled decomposition. Rupture discs shall be sized on the basis of tank design pressure, tank size and anticipated decomposition rate.

LR 15.5(h) Rupture disc calculations are to be submitted for approval.

LR 15.5(j) The rupture discs are to be protected against the weather and the adopted arrangements are not to impede dispersal of the vapour.

15.5.1.10 A fixed water-spray system shall be provided for diluting and washing away any concentrated hydrogen peroxide solution spilled on deck. The areas covered by the water-spray shall include the manifold/hose connections and the tank tops of those tanks designated for carrying hydrogen peroxide solutions. The minimum application rate shall satisfy the following criteria:

- .1 The product shall be diluted from the original concentration to 35% by mass within five minutes of the spill.
- .2 The rate and estimated size of the spill shall be based upon maximum anticipated loading and discharge rates, the time required to stop flow of cargo in the event of tank overfill or a piping/hose failure, and the time necessary to begin application of dilution water with actuation at the cargo control location or on the navigating bridge.

LR 15.5(k) Suitable transverse coamings are to be arranged on the tank deck at the ends of the cargo area designated for carrying hydrogen peroxide in order to confine any deck spills to the areas protected by water-spray.

LR 15.5(l) The maximum anticipated loading rates are to be submitted by the Owner or Builder to enable the rate and size of spills to be estimated.

15.5.1.11 Only those hydrogen peroxide solutions which have a maximum decomposition rate of 1% per year at 25°C shall be carried. Certification from the shipper that the product meets this standard shall be presented to the master and kept on board. A technical representative of the manufacturer shall be on board to monitor the transfer operations and have the capability to test the stability of the hydrogen peroxide. He shall certify to the master that the cargo has been loaded in a stable condition.

15.5.1.12 Protective clothing that is resistant to hydrogen peroxide solutions shall be provided for each crew member involved in cargo-transfer operations. Protective clothing shall include nonflammable coveralls, suitable gloves, boots and eye protection.

LR 15.5(m) In all cases, the dedicated nature of the ship's service will be reflected in the class notation.

15.5.2 *Hydrogen peroxide solutions over 8% but not over 60% by mass.*

15.5.2.1 The ship's shell plating shall not form any boundaries of tanks containing this product.

15.5.2.2 Hydrogen peroxide shall be carried in tanks thoroughly and effectively cleaned of all traces of previous cargoes and their vapours or ballast. Procedures for inspection, cleaning, passivation and loading of tanks shall be in accordance with MSC/Circ.394. A certificate shall be on board the vessel indicating that the procedures in the circular have been followed. The passivation requirement may be waived by an Administration for domestic shipments of short duration. Particular care in this respect is essential to ensure the safe carriage of hydrogen peroxide:

- .1 When hydrogen peroxide is carried no other cargoes shall be carried simultaneously.
- .2 Tanks which have contained hydrogen peroxide may be used for other cargoes after cleaning in accordance with the procedures outlined in MSC/Circ.394.
- .3 Consideration in design shall provide minimum internal tank structure, free draining, no entrapment and ease of visual inspection.

15.5.2.3 Cargo tanks and associated equipment shall be either pure aluminium (99,5%) or solid stainless steel of types suitable for use with hydrogen peroxide (e.g. 304, 304L, 316, 316L, 316Ti). Aluminium shall not be used for piping on deck. All non-metallic materials of construction for the containment system shall neither be attacked by hydrogen peroxide nor contribute to its decomposition.

LR 15.5(n) Full details of the passivation procedures are to be submitted.

15.5.2.4 Cargo tanks shall be separated by a cofferdam from fuel oil tanks or any other space containing materials incompatible with hydrogen peroxide.

15.5.2.5 Temperature sensors shall be installed at the top and bottom of the tank. Remote temperature readouts and continuous monitoring shall be located on the navigating bridge. If the temperature in the tank rises above 35°C, visible and audible alarms shall activate on the navigating bridge.

15.5.2.6 Fixed oxygen monitors (or gas-sampling lines) shall be provided in void spaces adjacent to tanks to detect leakage of the cargo into these spaces. The enhancement of flammability by oxygen enrichment shall be recognised. Remote readouts, continuous monitoring (if gas-sampling lines are used, intermittent sampling is satisfactory) and visible and audible alarms similar to those for the temperature sensors shall also be located on the navigating bridge. The visible and audible alarms shall activate if the oxygen concentration in these void spaces exceeds 30% by volume. Two portable oxygen monitors shall also be available as back-up systems.

LR 15.5(o) Leakages are to be dealt with to LR's satisfaction prior to loading a subsequent hydrogen peroxide cargo.

Special Requirements

Chapter 15

Section 5

LR 15.5(p) Since hydrogen peroxide is not a heated cargo, heating systems should not, in general, be arranged within cargo tanks. Where heating systems are fitted these are also to be provided with leakage detection arrangements.

15.5.2.7 As a safeguard against uncontrolled decomposition, a cargo-jettisoning system shall be installed to discharge the cargo overboard. The cargo shall be jettisoned if the temperature rise of the cargo exceeds a rate of 2°C per hour over a 5-hour period or when the temperature in the tank exceeds 40°C.

15.5.2.8 Cargo tank venting systems with filtration shall have pressure/vacuum-relief valves for normal controlled venting, and a device for emergency venting, should tank pressure rise rapidly as a result of an uncontrolled decomposition rate, as stipulated in 15.5.2.7. These venting systems shall be designed in such a manner that there is no introduction of seawater into the cargo tank even under heavy sea conditions. Emergency venting shall be sized on the basis of tank design pressure and tank size.

LR 15.5(q) Emergency venting arrangements and calculations are to be submitted for approval.

15.5.2.9 A fixed water-spray system shall be provided for diluting and washing away any concentrated solution spilled on deck. The areas covered by the water-spray shall include the manifold/hose connections and the tank tops of those tanks designated for the carriage of hydrogen peroxide solutions. The minimum application rate shall satisfy the following criteria:

- .1 The product shall be diluted from the original concentration to 35% by mass within five minutes of the spill.
- .2 The rate and estimated size of the spill shall be based upon maximum anticipated loading and discharge rates, the time required to stop flow of the cargo in the event of tank overfill or a piping/hose failure, and the time necessary to begin application of dilution water with actuation at the cargo control location or on the navigating bridge.

LR 15.5(r) Suitable transverse coamings are to be arranged on the tank deck at the ends of the cargo area designated for carrying hydrogen peroxide in order to confine any deck spills to the areas protected by water spray.

LR 15.5(s) The maximum anticipated loading rates are to be submitted by the Owner or Builder to enable the rate and size of spills to be estimated.

15.5.2.10 Only those hydrogen peroxide solutions which have a maximum decomposition rate of 1% per year at 25°C shall be carried. Certification from the shipper that the product meets this standard shall be presented to the master and kept on board. A technical representative of the manufacturer shall be on board to monitor the transfer operations and have the capability to test the stability of the hydrogen peroxide. He shall certify to the master that the cargo has been loaded in a stable condition.

15.5.2.11 Protective clothing that is resistant to hydrogen peroxide shall be provided for each crew member involved in cargo-transfer operations. Protective clothing shall include coveralls that are nonflammable, suitable gloves, boots and eye protection.

15.5.2.12 During transfer of hydrogen peroxide the related piping system shall be separated from all other systems. Cargo hoses used for transfer of hydrogen peroxide shall be marked 'FOR HYDROGEN PEROXIDE TRANSFER ONLY'.

15.5.3 *Procedures for inspection, cleaning, passivation and loading of tanks for the carriage of hydrogen peroxide solutions 8-60%, which have contained other cargoes, or for the carriage of other cargoes after the carriage of hydrogen peroxide.*

15.5.3.1 Tanks having contained cargoes other than hydrogen peroxide shall be inspected, cleaned and passivated before re-use for the transport of hydrogen peroxide solutions. The procedures for inspection and cleaning, as given in paragraphs 15.5.3.2 to 15.5.3.8 below, apply to both stainless steel and pure aluminium tanks (see paragraph 15.5.2.2). Procedures for passivation are given in paragraph 15.5.3.9 for stainless steel and 15.5.3.10 for aluminium. Unless otherwise specified, all steps apply to the tanks and to all associated equipment having been in contact with the other cargo.

15.5.3.2 After unloading the previous cargo the tank shall be rendered safe and inspected for any residues, scale and rust.

15.5.3.3 Tanks and associated equipment shall be washed with clean filtered water. The water to be used shall at least have the quality of potable water with a low chlorine content.

15.5.3.4 Trace residues and vapours of the previous cargo shall be removed by steaming of tank and equipment.

15.5.3.5 Tank and equipment are washed again with clean water (quality as above) and dried, using filtered, oil-free air.

15.5.3.6 The atmosphere in the tank shall be sampled and investigated for the presence of organic vapours and oxygen concentration.

15.5.3.7 The tank shall be checked again by visual inspection for residues of the previous cargo, scale and rust as well as for any smell of the previous cargo.

15.5.3.8 If inspection or measurements indicate the presence of residues of the previous cargo or its vapours, actions described in paragraphs 15.5.3.3 to 15.5.3.5 shall be repeated.

Special Requirements

Chapter 15

Section 5

15.5.3.9 Tank and equipment made from stainless steel which have contained other cargoes than hydrogen peroxide or which have been under repair shall be cleaned and passivated, regardless of any previous passivation, according to the following procedure:

1. New welds and other repaired parts shall be cleaned and finished using stainless steel wire brush, chisel, sandpaper or buff. Rough surfaces shall be given a smooth finish. A final polishing is necessary.
- .2 Fatty and oily residues shall be removed by the use of appropriate organic solvents or detergent solutions in water. The use of chlorine containing compounds shall be avoided as they can seriously interfere with passivation.
- .3 The residues of the degreasing agent shall be removed, followed by a washing with water.
- .4 In the next step, scale and rust shall be removed by the application of acid (e.g. a mixture of nitric and hydrofluoric acids), followed again by a washing with clean water.
- .5 All the metal surfaces which can come into contact with hydrogen peroxide shall be passivated by the application of nitric acid of a concentration between 10 and 35% by mass. The nitric acid must be free from heavy metals, other oxidising agents or hydrogen fluoride. The passivation process shall continue for 8 to 24 h, depending upon the concentration of acid, the ambient temperature and other factors. During this time a continuous contact between the surfaces to be passivated and the nitric acid shall be ensured. In the case of large surfaces this may be achieved by recirculating the acid. Hydrogen gas may be evolved in the passivation process, leading to the presence of an explosive atmosphere in the tanks. Therefore, appropriate measures must be taken to avoid the build-up or the ignition of such an atmosphere.
- .6 After passivation the surfaces shall be thoroughly washed with clean filtered water. The washing process shall be repeated until the effluent water has the same pH value as the incoming water.
- .7 Surfaces treated according to the above steps may cause some decomposition when coming into contact with hydrogen peroxide for the first time. This decomposition will cease after a short time (usually within two or three days). Therefore an additional flushing with hydrogen peroxide for a period of at least two days is recommended.
- .8 Only degreasing agents and acid cleaning agents which have been recommended for this purpose by the manufacturer of the hydrogen peroxide shall be used in the process.

15.5.3.10 Tanks and equipment made from aluminium and which have contained cargoes other than hydrogen peroxide, or which have been under repair, shall be cleaned and passivated. The following is an example of a recommended procedure:

- .1 The tank shall be washed with a solution of a sulphonated detergent in hot water, followed by a washing with water.

- .2 The surface shall then be treated for 15 to 20 min with a solution of sodium hydroxide of a concentration of 7% by mass or treated for a longer period with a less concentrated solution (e.g. for 12 h with 0.4 to 0.5% sodium hydroxide). To prevent excessive corrosion at the bottom of the tank when treating with more concentrated solutions of sodium hydroxide, water shall be added continuously to dilute the sodium hydroxide solution which collects there.
- .3 The tank shall be thoroughly washed with clean, filtered water. As soon as possible after washing, the surface shall be passivated by the application of nitric acid of a concentration between 30 and 35% by mass. The passivation process shall continue for 16 to 24 h. During this time a continuous contact between the surfaces to be passivated and the nitric acid shall be ensured.
- .4 After passivation the surfaces shall be thoroughly washed with clean, filtered water. The washing process shall be repeated until the effluent water has the same pH value as the incoming water.
- .5 A visual inspection shall be made to ensure that all surfaces have been treated. It is recommended that an additional flushing is carried out for a minimum of 24 h with dilute hydrogen peroxide solution of a concentration approximately 3% by mass.

15.5.3.11 The concentration and stability of the hydrogen peroxide solution to be loaded shall be determined.

15.5.3.12 The hydrogen peroxide is loaded under intermittent visual supervision of the interior of the tank from an appropriate opening.

15.5.3.13 If substantial bubbling is observed which does not disappear within 15 min after the completion of loading, the contents of the tank shall be unloaded and disposed of in an environmentally safe manner. The tank and equipment shall then be repassivated as described above.

15.5.3.14 The concentration and stability of the hydrogen peroxide solution shall be determined again. If the same values are obtained within the limits of error as in paragraph 15.5.3.10, the tank is considered to be properly passivated and the cargo ready for shipment.

15.5.3.15 Actions described in paragraphs 15.5.3.2 to 15.5.3.8 shall be carried out under the supervision of the master or shipper. Actions described in paragraphs 15.5.3.9 to 15.5.3.15 shall be carried out under the on-site supervision and responsibility of a representative of the hydrogen peroxide manufacturer or under supervision and responsibility of another person familiar with the safety-relevant properties of hydrogen peroxide.

Special Requirements

Chapter 15

Sections 5, 6 & 7

15.5.3.16 The following procedure shall be applied when tanks having contained hydrogen peroxide solution are to be used for other products (unless otherwise specified, all steps apply to the tanks and to all associated equipment having been in contact with hydrogen peroxide):

- .1 Hydrogen peroxide cargo residue shall be drained as completely as possible from tanks and equipment.
- .2 Tanks and equipment shall be rinsed with clean water, and subsequently thoroughly washed with clean water.
- .3 The interior of the tank shall be dried and inspected for any residues.

Steps .1 to .3, in 15.5.3.16, shall be carried out under the supervision of the master or the shipper. Step .3 in paragraph 15.5.3.16 shall be carried out by a person familiar with the safety-relevant properties of the chemical to be transported and of hydrogen peroxide.

SPECIAL CAUTIONS:

- 1 Hydrogen peroxide decomposition may enrich the atmosphere with oxygen and appropriate precautions shall be observed.
- 2 Hydrogen gas may be evolved in the passivation processes described in paragraphs 15.5.3.9.5, 15.5.3.10.2 and 15.5.3.10.4, leading to the presence of an explosive atmosphere in the tank. Therefore, appropriate measures must be taken to avoid the build-up or the ignition of such an atmosphere.

15.6 Motor fuel anti-knock compounds (containing lead alkyls)

15.6.1 Tanks used for these cargoes shall not be used for the transportation of any other cargo except those commodities to be used in the manufacture of motor fuel anti-knock compounds containing lead alkyls.

15.6.2 If a cargo pump-room is located on deck level according to 15.18, the ventilation arrangements should be in compliance with 15.17.

15.6.3 Entry into cargo tanks used for the transportation of these cargoes is not permitted unless approved by the Administration.

15.6.4 Air analysis shall be made for lead content to determine if the atmosphere is satisfactory prior to allowing personnel to enter the cargo pump-room or void spaces surrounding the cargo tank.

LR 15.6(a) Warning notices are to be posted accordingly.

15.7 Phosphorus, yellow or white

LR 15.7(a) The following requirements apply to carriage at a cargo temperature in the range between 45°C and 60°C.

LR 15.7(b) The liquid is to be carried in independent, externally insulated tanks. The tanks are to be supported and keyed such as to permit free expansion in all directions and eliminate heat bridges which may transmit thermal stresses to the ship's hull. Account is to be taken of the dynamic loading which will be experienced by the tanks, supports and keys in service. Calculations are to be submitted.

LR 15.7(c) The hull arrangements may require to incorporate two longitudinal bulkheads for strength reasons in view of the relative density of phosphorus.

15.7.1 Phosphorus shall, at all times, be loaded, carried and discharged under a water pad of 760 mm minimum depth. During discharge operations, arrangements shall be made to ensure that water occupies the volume of phosphorus discharged. Any water discharged from a phosphorus tank shall be returned only to a shore installation.

15.7.2 Tanks shall be designed and tested to a minimum equivalent water head of 2.4 m above the top of the tank, under designed loading conditions, taking into account the depth, relative density and method of loading and discharge of the phosphorus.

15.7.3 Tanks shall be so designed as to minimise the interfacial area between the liquid phosphorus and its water pad.

15.7.4 A minimum ullage space of 1% shall be maintained above the water pad. The ullage space shall be filled with inert gas or naturally ventilated by two cowled standpipes terminating at different heights but at least 6 m above the deck and at least 2 m above the pump-house top.

15.7.5 All openings shall be at the top of cargo tanks, and fittings and joints attached thereto shall be of materials resistant to phosphorus pentoxide.

15.7.6 Phosphorus shall be loaded at a temperature not exceeding 60°C.

15.7.7 Tank heating arrangements shall be external to tanks and have a suitable method of temperature control to ensure that the temperature of the phosphorus does not exceed 60°C. A high-temperature alarm shall be fitted.

15.7.8 A water drench system acceptable to the Administration shall be installed in all void spaces surrounding the tanks. The system shall operate automatically in the event of an escape of phosphorus.

15.7.9 Void spaces referred to in 15.7.8 shall be provided with effective means of mechanical ventilation which shall be capable of being sealed off quickly in an emergency.

15.7.10 Loading and discharge of phosphorus shall be governed by a central system on the ship which, in addition to incorporating high-level alarms, shall ensure that no overflow of tanks is possible and that such operations can be stopped quickly in an emergency from either ship or shore.

Special Requirements

Chapter 15

Sections 7 & 8

15.7.11 During cargo transfer, a water hose on deck shall be connected to a water supply and kept flowing throughout the operation so that any spillage of phosphorus may be washed down with water immediately.

LR 15.7(d) Notices are to be posted in the wheelhouse and cargo control room to the effect that a water hose on deck should be connected to a water supply which is to be kept flowing throughout the cargo transfer operation.

15.7.12 Ship-to-shore loading and discharge connections shall be of a type approved by the Administration.

15.8 Propylene oxide or ethylene oxide/propylene oxide mixtures with an ethylene oxide content of not more than 30% by mass

15.8.1 Products transported under the provisions of this section shall be acetylene-free.

15.8.2 Unless cargo tanks are properly cleaned, these products shall not be carried in tanks which have contained as one of the three previous cargoes any products known to catalyse polymerization, such as:

- .1 mineral acids (e.g. sulphuric, hydrochloric, nitric);
- .2 carboxylic acids and anhydrides (e.g. formic, acetic);
- .3 halogenated carboxylic acids (e.g. chloroacetic);
- .4 sulphonic acids (e.g. benzenesulphonic);
- .5 caustic alkalis (e.g. sodium hydroxide, potassium hydroxide);
- .6 ammonia and ammonia solutions;
- .7 amines and amine solutions, and;
- .8 oxidising substances.

15.8.3 Before loading, tanks shall be thoroughly and effectively cleaned, to remove all traces of previous cargoes from tanks and associated pipework, except where the immediately prior cargo has been propylene oxide or ethylene oxide/propylene oxide mixtures. Particular care shall be taken in the case of ammonia in tanks made of steel other than stainless steel.

15.8.4 In all cases, the effectiveness of cleaning procedures for tanks and associated pipework shall be checked by suitable testing or inspection, to ascertain that no traces of acidic or alkaline materials remain that might create a hazardous situation in the presence of these products.

15.8.5 Tanks shall be entered and inspected prior to each initial loading of these products to ensure freedom from contamination, heavy rust deposits and visible structural defects. When cargo tanks are in continuous service for these products, such inspections shall be performed at intervals of not more than two years.

15.8.6 Tanks for the carriage of these products shall be of steel or stainless steel construction.

15.8.7 Tanks for the carriage of these products may be used for other cargoes after thorough cleaning of tanks and associated pipework systems by washing or purging.

15.8.8 All valves, flanges, fittings and accessory equipment shall be of a type suitable for use with the products and shall be constructed of steel or stainless steel in accordance with recognised standards. Discs or disc faces, seats and other wearing parts of valves shall be made of stainless steel containing not less than 11% chromium.

15.8.9 Gaskets shall be constructed of materials which do not react with, dissolve in, or lower the autoignition temperature of these products and which are fire-resistant and possess adequate mechanical behaviour. The surface presented to the cargo shall be polytetrafluorethylene (PTFE), or materials giving a similar degree of safety by their inertness. Spirally wound stainless steel, with a filler of PTFE or similar fluorinated polymer, may be accepted.

15.8.10 Insulation and packing, if used, shall be of a material which does not react with, dissolve in, or lower the autoignition temperature of these products.

15.8.11 The following materials are generally found unsatisfactory for gaskets, packing and similar uses in containment systems for these products and would require testing before being approved by the Administration:

- .1 neoprene or natural rubber, if it comes into contact with the products.
- .2 asbestos, or binders used with asbestos.
- .3 materials containing oxides of magnesium, such as mineral wools.

15.8.12 Threaded joints shall not be permitted in the cargo liquid and vapour lines.

15.8.13 Filling and discharge piping shall extend to within 100 mm of the bottom of the tank or any sump pit.

15.8.14.1 The containment system for a tank containing these products shall have a valved vapour-return connection.

15.8.14.2 The products shall be loaded and discharged in such a manner that venting of the tanks to atmosphere does not occur. If vapour return to shore is used during tank loading, the vapour-return system connected to a containment system for the product shall be independent of all other containment systems.

15.8.14.3 During discharge operations, the pressure in the cargo tank must be maintained above 0.007 MPa gauge.

15.8.15 The cargo may be discharged only by deepwell pumps, hydraulically operated submerged pumps, or inert-gas displacement. Each cargo pump shall be arranged to ensure that the product does not heat significantly if the discharge line from the pump is shut off or otherwise blocked.

Special Requirements

Chapter 15

Section 8

15.8.16 Tanks carrying these products shall be vented independently of tanks carrying other products. Facilities shall be provided for sampling the tank contents without opening the tank to atmosphere.

15.8.17 Cargo hoses used for transfer of these products shall be marked "FOR ALKYLENE OXIDE TRANSFER ONLY".

15.8.18 Cargo tanks, void spaces and other enclosed spaces adjacent to an integral gravity cargo tank carrying propylene oxide should either contain a compatible cargo (those cargoes specified in 15.8.2 are examples of substances considered incompatible) or be inerted by injection of a suitable inert gas. Any hold space in which an independent cargo tank is located shall be inerted. Such inerted spaces and tanks shall be monitored for these products and oxygen. The oxygen content of these spaces shall be maintained below 2%. Portable sampling equipment is satisfactory.

15.8.19 In no case shall air be allowed to enter the cargo pump or piping system while these products are contained within the system.

15.8.20 Prior to disconnecting shore-lines, the pressure in liquid and vapour lines shall be relieved through suitable valves installed at the loading header. Liquid and vapour from these lines shall not be discharged to atmosphere.

15.8.21 Propylene oxide may be carried in pressure tanks or in independent or integral gravity tanks. Ethylene oxide/propylene oxide mixtures should be carried in independent gravity tanks or pressure tanks. Tanks shall be designed for the maximum pressure expected to be encountered during loading, conveying and discharging cargo.

15.8.22.1 Tanks for the carriage of propylene oxide with a design pressure less than 0.06 MPa gauge and tanks for the carriage of ethylene oxide/propylene oxide mixtures with a design pressure less than 0.12 MPa gauge shall have a cooling system to maintain the cargo below the reference temperature.

15.8.22.2 The refrigeration requirement for tanks with a design pressure less than 0.06 MPa gauge may be waived by the Administration for ships operating in restricted areas or on voyages of restricted duration, and account may be taken in such cases of any insulation of the tanks. The area and times of year for which such carriage would be permitted shall be included in the conditions of carriage of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

15.8.23.1 Any cooling system shall maintain the liquid temperature below the boiling temperature at the containment pressure. At least two complete cooling plants, automatically regulated by variations within the tanks, shall be provided. Each cooling plant shall be complete with the necessary auxiliaries for proper operation. The control system shall also be capable of being manually operated. An alarm shall be provided to indicate malfunctioning of the temperature controls. The capacity of each cooling system shall be sufficient to maintain the temperature of the liquid cargo below the reference temperature of the system.

15.8.23.2 An alternative arrangement may consist of three cooling plants, any two of which shall be sufficient to maintain the liquid temperature below the reference temperature.

15.8.23.3 Cooling media which are separated from the products by a single wall only shall be nonreactive with the products.

15.8.23.4 Cooling systems requiring compression of the products shall not be used.

15.8.24 Pressure-relief-valve settings shall not be less than 0.02 MPa gauge and for pressure tanks not greater than 0.7 MPa gauge for the carriage of propylene oxide and not greater than 0.53 MPa gauge for the carriage of propylene oxide/ethylene oxide mixtures.

15.8.25.1 The piping system for tanks to be loaded with these products shall be separated (as defined in 3.1.4) from piping systems for all other tanks, including empty tanks. If the piping system for the tanks to be loaded is not independent (as defined in 1.3.18), the required piping separation should be accomplished by the removal of spool-pieces, valves, or other pipe section and the installation of blank flanges at these locations. The required separation applies to all liquid and vapour piping, liquid and vapour vent lines and any other possible connections, such as common inert-gas supply lines.

15.8.25.2 These products may be transported only in accordance with cargo-handling plans that have been approved by the Administration. Each intended loading arrangement shall be shown on a separate cargo-handling plan. Cargo-handling plans shall show the entire cargo piping system and the locations for installation of blank flanges needed to meet the above piping separation requirements. A copy of each approved cargo-handling plan shall be maintained on board the ship. The International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk should be endorsed to include reference to the approved cargo-handling plans.

15.8.25.3 Before each initial loading of these products and before every subsequent return to such service, certification verifying that the required piping separation has been achieved shall be obtained from a responsible person acceptable to the Port Administration and carried on board the ship. Each connection between a blank flange and a pipeline flange shall be fitted with a wire and seal by the responsible person to ensure that in-advertent removal of the blank flange is impossible.

15.8.26.1 No cargo tanks shall be more than 98% liquid-full at the reference temperature.

Special Requirements

Chapter 15

Sections 8, 9 & 10

15.8.26.2 The maximum volume to which a cargo tank shall be loaded is:

$$V_L = 0,98V \frac{\rho_R}{\rho_L}$$

where

V_L = maximum volume to which the tank may be loaded

V = volume of the tank

ρ_R = density of cargo at the reference temperature

ρ_L = density of cargo at the loading temperature and pressure.

15.8.26.3 The maximum allowable tank filling limits for each cargo tank shall be indicated for each loading temperature which may be applied and for the applicable maximum reference temperature, on a list to be approved by the Administration. A copy of the list shall be permanently kept on board by the master.

15.8.27 The cargo shall be carried under a suitable protective padding of nitrogen gas. An automatic nitrogen make-up system shall be installed to prevent the tank pressure falling below 0.007 MPa gauge in the event of product temperature fall due to ambient conditions or maloperation of refrigeration systems. Sufficient nitrogen shall be available on board to satisfy the demand of the automatic pressure control. Nitrogen of commercially pure quality (99,9% by volume) shall be used for padding. A battery of nitrogen bottles connected to the cargo tanks through a pressure-reduction valve satisfies the intention of the expression 'automatic' in this context.

15.8.28 The cargo tank vapour space shall be tested prior to and after loading to ensure that the oxygen content is 2% by volume or less.

15.8.29 A water-spray system of sufficient capacity shall be provided to blanket effectively the area surrounding the loading manifold, the exposed deck piping associated with product handling, and the tank domes. The arrangement of piping and nozzles shall be such as to give a uniform distribution rate of 10 l/m²/min. Remote manual operation shall be arranged such that remote starting of pumps supplying the water-spray system and remote operation of any normally closed valves in the system can be carried out from a suitable location outside the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected. The water-spray system shall be capable of both local and remote manual operation, and the arrangement shall ensure that any spilled cargo is washed away. Additionally, a water hose with pressure to the nozzle, when atmospheric temperatures permit, shall be connected ready for immediate use during loading and unloading operations.

15.8.30 A remotely operated, controlled closing-rate, shutoff valve shall be provided at each cargo-hose connection used during cargo transfer.

15.9 Sodium chlorate solution (50% or less by mass)

15.9.1 Tanks and associated equipment, which have contained this product may be used for other cargoes after thorough cleaning by washing or purging.

15.9.2 In the event of spillage of this product, all spilled liquid shall be thoroughly washed away without delay. To minimise fire risk, spillage shall not be allowed to dry out.

15.10 Sulphur (molten)

LR 15.10(a) The following requirements apply to carriage within the temperature range 138°C to 155°C.

LR 15.10(b) The liquid is to be carried in independent, externally insulated tanks which are so supported and keyed as to permit free expansion in all directions and eliminate heat bridges which may transmit thermal stresses to the hull. Account is to be taken of the dynamic loading which will be experienced by the tanks, supports and keys in service. Calculations are to be submitted.

LR 15.10(c) The internal arrangements at the top of the tank are to be such as to minimise the possible entrapment of pockets of hazardous vapour. An expansion trunk is to be arranged to ensure that the level of sulphur remains in the trunk when the tank is fully loaded.

LR 15.10(d) The hull arrangements may require to incorporate two longitudinal bulkheads for strength reasons in view of the relative density of sulphur liquid.

15.10.1 Cargo tank ventilation shall be provided to maintain the concentration of hydrogen sulphide below one half of its lower explosive limit through-out the cargo-tank vapour space for all conditions of carriage (i.e. below 1.85% by volume).

15.10.2 Where mechanical ventilation systems are used for maintaining low gas concentrations in cargo tanks, an alarm system shall be provided to give warning if the system fails.

15.10.3 Ventilation systems shall be so designed and arranged as to preclude depositing of sulphur within the system.

15.10.4 Openings to void spaces adjacent to cargo tanks shall be so designed and fitted as to prevent the entry of water, sulphur or cargo vapour.

15.10.5 Connections shall be provided to permit sampling and analysing of vapour in void spaces.

15.10.6 Cargo temperature controls shall be provided to ensure that the temperature of the sulphur does not exceed 155°C.

Special Requirements

Chapter 15

Sections 10 to 13

15.10.7 Sulphur (molten) has a flashpoint above 60°C; however, electrical equipment shall be certified safe for gases evolved.

15.11 Acids

15.11.1 The ship's shell plating shall not form any boundaries of tanks containing mineral acids.

15.11.2 Proposals for lining steel tanks and related piping systems with corrosion-resistant materials may be considered by the Administration. The elasticity of the lining shall not be less than that of the supporting boundary plating.

LR 15.11(a) The internal cargo tank surface is to be smooth and free of obstruction, and the arrangements at corners are to be appropriate to the intended lining arrangements.

LR 15.11(b) A corrosion protection lining, when applied to the tank or piping surfaces, is to be applied in solid state. Application in liquid state is not permitted because it may be difficult to ensure adequate control of the thickness of the lining at edges and corners, and to ensure the necessary control of the curing process. A lining approved for use with acids is an acid-resistant material that is applied to the tank or piping system in a solid state with a defined elasticity property, which is to be greater than the elasticity of the structural steel.

15.11.3 Unless constructed wholly of corrosion-resistant materials or fitted with an approved lining, the plating thickness shall take into account the corrosivity of the cargo.

15.11.4 Flanges of the loading and discharge manifold connections shall be provided with shields, which may be portable, to guard against the danger of the cargo being sprayed; and in addition, drip trays shall also be provided to guard against leakage on to the deck.

15.11.5 Because of the danger of evolution of hydrogen when these substances are being carried, the electrical arrangements shall comply with 10.1.4. The certified safe type equipment should be suitable for use in hydrogen/air mixtures. Other sources of ignition shall not be permitted in such spaces.

15.11.6 Substances subjected to the requirements of this section shall be segregated from oil fuel tanks, in addition to the segregation requirements in 3.1.1.

15.11.7 Provision shall be made for suitable apparatus to detect leakage of cargo into adjacent spaces.

15.11.8 The cargo pump-room bilge pumping and drainage arrangements shall be of corrosion-resistant materials.

15.12 Toxic products

15.12.1 Exhaust openings of tank vent systems shall be located:

- .1 at a height of $B/3$ or 6 m, whichever is greater, above the weather deck or, in the case of a deck tank, the access gangway;
- .2 not less than 6 m above the fore-and-aft gangway, if fitted within 6 m of the gangway;
- .3 15 m from any opening or air intake to any accommodation and service spaces; and
- .4 the vent height may be reduced to 3 m above the deck or fore-and-aft gangway, as applicable, provided high-velocity vent valves of an approved type, directing the vapour/air mixture upwards in an unimpeded jet with an exit velocity of at least 30 m/s, are fitted.

15.12.2 Tank venting systems shall be provided with a connection for a vapour-return line to the shore installation.

LR 15.12(a) Vapour return lines are to be fitted with shut-off valves and blank flanges.

15.12.3 Products shall :

- .1 not be stowed adjacent to oil fuel tanks;
- .2 have separate piping systems; and
- .3 have tank vent systems separate from tanks containing non-toxic products.

15.12.4 Cargo tank relief-valve settings shall be a minimum of 0.02 MPa gauge.

15.13 Cargoes protected by additives

15.13.1 Certain cargoes with a reference in *column o* in the table of chapter 17, by the nature of their chemical make-up, tend, under certain conditions of temperature, exposure to air or contact with a catalyst, to undergo polymerization, decomposition, oxidation or other chemical changes. Mitigation of this tendency is carried out by introducing small amounts of chemical additives into the liquid cargo or controlling the cargo tank environment.

15.13.2 Ships carrying these cargoes shall be so designed as to eliminate from the cargo tanks and cargo-handling system any material of construction or contaminants which could act as a catalyst or destroy the inhibitor.

15.13.3 Care shall be taken to ensure that these cargoes are sufficiently protected to prevent deleterious chemical change at all times during the voyage. Ships carrying such cargoes shall be provided with a certificate of protection from the manufacturer, and kept during the voyage, specifying:

- .1 the name and amount of additive present;
- .2 whether the additive is oxygen-dependent;
- .3 date additive was put in the product and duration of effectiveness;
- .4 any temperature limitations qualifying the additives' effective lifetime; and
- .5 the action to be taken shall the length of voyage exceed the effective lifetime of the additives.

* For equivalency arrangements for the carriage of styrene monomer, see MSC/Circ.879 and MSC/Circ.879/Corr.1

Special Requirements

Chapter 15

Sections 13 to 16

15.13.4 Ships using the exclusion of air as the method of preventing oxidation of the cargo shall comply with 9.1.3.

15.13.5 A product containing an oxygen-dependent additive shall be carried without inertion (in tanks of a size not greater than 3,000 m³). Such cargoes shall not be carried in a tank requiring inertion under the requirements of SOLAS chapter II-2*.

15.13.6 Venting systems shall be of a design that eliminates blockage from polymer build-up. Venting equipment shall be of a type that can be checked periodically for adequacy of operation.

15.13.7 Crystallisation or solidification of cargoes normally carried in the molten state can lead to depletion of inhibitor in parts of the tank's contents. Subsequent remelting can thus yield pockets of uninhibited liquid, with the accompanying risk of dangerous polymerization. To prevent this, care shall be taken to ensure that at no time are such cargoes allowed to crystallise or solidify, either wholly or partially, in any part of the tank. Any required heating arrangements shall be such as to ensure that in no part of the tank does cargo become overheated to such an extent that any dangerous polymerization can be initiated. If the temperature from steam coils would induce overheating, an indirect low-temperature heating system shall be used.

15.14 Cargoes with a vapour pressure greater than 0.1013 MPa absolute at 37.8°C

15.14.1 For a cargo referenced in *column o* in the table of chapter 17 to this section, a mechanical refrigeration system shall be provided unless the cargo system is designed to withstand the vapour pressure of the cargo at 45°C. Where the cargo system is designed to withstand the vapour pressure of the cargo at 45°C, and no refrigeration system is provided, a notation shall be made in the conditions of carriage on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk to indicate the required relief-valve setting for the tanks.

15.14.2 A mechanical refrigeration system shall maintain the liquid temperature below the boiling temperature at the cargo tank design pressure.

15.14.3 When ships operate in restricted areas and at restricted times of the year, or on voyages of limited duration, the Administration involved may agree to waive requirements for a refrigeration system. A notation of any such agreement, listing geographic area restrictions and times of the year, or voyage duration limitations, shall be included in the conditions of carriage on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

15.14.4 Connections shall be provided for returning expelled gases to shore during loading.

LR 15.14(a) Vapour return lines are to be fitted with shut-off valves and blank flanges.

15.14.5 Each tank shall be provided with a pressure gauge which indicates the pressure in the vapour space above the cargo.

15.14.6 Where the cargo needs to be cooled, thermometers shall be provided at the top and bottom of each tank.

15.14.7.1 No cargo tanks shall be more than 98% liquid-full at the reference temperature (R).

15.14.7.2 The maximum volume (V_L) of cargo to be loaded in a tank shall be:

$$V_L = 0,98V \frac{\rho_R}{\rho_L}$$

where

V = volume of the tank

ρ_R = density of cargo at the reference temperature (R)

ρ_L = density of cargo at the loading temperature.

15.14.7.3 The maximum allowable tank filling limits for each cargo tank shall be indicated for each loading temperature which may be applied, and for the applicable maximum reference temperature, on a list approved by the Administration. A copy of the list shall be permanently kept on board by the master.

15.15 Cargoes with low ignition temperature and wide flammability range

Deleted.

15.16 Cargo contamination

15.16.1 Deleted.

15.16.2 Where *column o* in the table of chapter 17 refers to this section, water shall not be allowed to contaminate this cargo. In addition, the following provisions apply:

- .1 Air inlets to pressure/vacuum-relief valves of tanks containing the cargo shall be situated at least 2 m above the weather deck.
- .2 Water or steam shall not be used as the heat-transfer media in a cargo temperature control system required by chapter 7.
- .3 The cargo shall not be carried in cargo tanks adjacent to permanent ballast or water tanks unless the tanks are empty and dry.
- .4 The cargo shall not be carried in tanks adjacent to slop tanks or cargo tanks containing ballast or slops or other cargoes containing water which may react in a dangerous manner. Pumps, pipes or vent lines serving such tanks shall be separate from similar equipment serving tanks containing the cargo. Pipelines from slop tanks or ballast lines shall not pass through tanks containing the cargo unless encased in a tunnel.

Special Requirements

Chapter 15

Sections 17 to 21

15.17 Increased ventilation requirements

For certain products, the ventilation system as described in 12.1.3 shall have a minimum capacity of at least 45 changes of air per hour, based upon the total volume of space. The ventilation system exhaust ducts shall discharge at least 10 m away from openings into accommodation spaces, work areas or other similar spaces, and intakes to ventilation systems, and at least 4 m above the tank deck.

15.18 Special cargo pump-room requirements

For certain products, the cargo pump-room shall be located on the deck level or cargo pumps shall be located in the cargo tank. The Administration may give special consideration to cargo pump-rooms below deck.

15.19 Overflow control

15.19.1 The provisions of this section are applicable where specific reference is made in *column o* in the table of chapter 17, and are in addition to the requirements for gauging devices.

15.19.2 In the event of a power failure on any system essential for safe loading, an alarm should be given to the operators concerned.

15.19.3 Loading operations shall be terminated at once in the event of any system essential for safe loading becoming inoperative.

15.19.4 Level alarms shall be capable of being tested prior to loading.

15.19.5 The high-level alarm system required under 15.19.6 shall be independent of the overflow-control system required by 15.19.7 and shall be independent of the equipment required by 13.1.

15.19.6 Cargo tanks shall be fitted with a visual and audible high-level alarm which complies with 15.19.1 to 15.19.5 and which indicates when the liquid level in the cargo tank approaches the normal full condition.

15.19.7 A tank overflow-control system required by this section shall:

- .1 come into operation when the normal tank loading procedures fail to stop the tank liquid level exceeding the normal full condition;
- .2 give a visual and audible tank-overflow alarm to the ship's operator; and
- .3 provide an agreed signal for sequential shutdown of onshore pumps or valves or both and of the ship's valves. The signal, as well as the pump and valve shutdown, may be dependent on operator's intervention. The use of shipboard automatic closing valves shall be permitted only when specific approval has been obtained from the Administration and the port State authority concerned.

15.19.8 The loading rate (LR) of the tank shall not exceed:

$$LR = \frac{3600U}{t} \quad (\text{m}^3/\text{h})$$

where

U = ullage volume (m³) at operating signal level;
t = time (s) needed from the initiating signal to fully stopping the cargo flow into the tank, being the sum of times needed for each step in sequential operations such as operator's responses to signals, stopping pumps and closing valves;

and shall also take into account the pipeline system design pressure.

15.20 Alkyl (C₇-C₉) nitrates, all isomers

15.20.1 The carriage temperature of the cargo shall be maintained below 100°C to prevent the occurrence of a self-sustaining, exothermic decomposition reaction.

15.20.2 The cargo may not be carried in independent pressure vessels permanently affixed to the vessel's deck unless:

- .1 the tanks are sufficiently insulated from fire; and
- .2 the vessel has a water deluge system for the tanks such that the cargo temperature is maintained below 100°C and the temperature rise in the tanks does not exceed 1.5°C/hour for a fire of 650°C.

15.21 Temperature sensors

Temperature sensors shall be used to monitor the cargo pump temperature to detect overheating due to pump failures.

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Operational Requirements

Chapter 16

Sections 1 to 4

16.1 Maximum allowable quantity of cargo per tank

16.1.1 The quantity of a cargo required to be carried in a type 1 ship shall not exceed 1,250 m³ in any one tank.

16.1.2 The quantity of cargo required to be carried in a type 2 ship shall not exceed 3,000 m³ in any one tank.

16.1.3 Tanks carrying liquids at ambient temperatures shall be so loaded as to avoid the tank becoming liquid-full during the voyage, having due regard to the highest temperature which the cargo may reach.

16.2 Cargo information

16.2.1 A copy of this Code, or national regulations incorporating the provisions of this Code, shall be on board every ship covered by this Code.

16.2.2 Any cargo offered for bulk shipment shall be indicated in the shipping documents by the product name, under which it is listed in chapter 17 or 18 of the Code or the latest edition of MEPC.2/Circ. or under which it has been provisionally assessed. Where the cargo is a mixture, an analysis indicating the dangerous components contributing significantly to the total hazard of the product shall be provided, or a complete analysis if this is available. Such an analysis shall be certified by the manufacturer or by an independent expert acceptable to the Administration.

16.2.3 Information shall be on board, and available to all concerned, giving the necessary data for the safe carriage in bulk of the cargo. Such information shall include a cargo stowage plan, to be kept in an accessible place, indicating all cargo on board, including each dangerous chemical carried:

- .1 a full description of the physical and chemical properties, including reactivity, necessary for the safe containment of the cargo;
- .2 action to be taken in the event of spills or leaks;
- .3 countermeasures against accidental personal contact;
- .4 fire-fighting procedures and fire-fighting media;
- .5 procedures for cargo transfer, tank cleaning, gas-freeing and ballasting; and
- .6 for those cargoes required to be stabilized or inhibited, the cargo shall be refused if the certificate required by these paragraphs is not supplied.

16.2.4 If sufficient information, necessary for the safe transportation of the cargo, is not available, the cargo shall be refused.

16.2.5 Cargoes which evolve highly toxic imperceptible vapours shall not be transported unless perceptible additives are introduced into the cargo.

16.2.6 Where *column o* in the table of chapter 17 refers to this paragraph, the cargo's viscosity at 20°C shall be specified on a shipping document, and if the cargo's viscosity exceeds 50 mPa.s at 20°C, the temperature at which the cargo has a viscosity of 50 mPa.s shall be specified in the shipping document.

16.2.7 Deleted.

16.2.8 Deleted.

16.2.9 Where *column o* in the table of chapter 17 refers to this paragraph, the cargo's melting point shall be indicated in the shipping document.

16.3 Personnel training

16.3.1 All personnel shall be adequately trained in the use of protective equipment and have basic training in the procedures appropriate to their duties necessary under emergency conditions.

16.3.2 Personnel involved in cargo operations shall be adequately trained in handling procedures.

16.3.3 Officers shall be trained in emergency procedures to deal with conditions of leakage, spillage or fire involving the cargo, and a sufficient number of them shall be instructed and trained in essential first aid for cargoes carried, based on the guidelines developed by the Organization*.

16.4 Opening of and entry into cargo tanks

16.4.1 During handling and carriage of cargoes producing flammable and/or toxic vapours, or both, or when ballasting after the discharge of such cargo, or when loading or unloading cargo, cargo tank lids shall always be kept closed. With any hazardous cargo, cargo tank lids, ullage and sighting ports and tank washing access covers shall be open only when necessary.

16.4.2 Personnel shall not enter cargo tanks, void spaces around such tanks, cargo-handling spaces or other enclosed spaces unless:

- .1 the compartment is free of toxic vapours and not deficient in oxygen; or
- .2 personnel wear breathing apparatus and other necessary protective equipment, and the entire operation is under the close supervision of a responsible officer.

16.4.3 Personnel shall not enter such spaces when the only hazard is of a purely flammable nature, except under the close supervision of a responsible officer.

* Refer to the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG), which provides advice on the treatment of casualties in accordance with the symptoms exhibited as well as equipment and antidotes that may be appropriate for treating the casualty and to the relevant provisions of the STCW Code, parts A and B.

Operational Requirements

Chapter 16

Sections 5 & 6

16.5 Stowage of cargo samples

16.5.1 Samples which have to be kept on board shall be stowed in a designated space situated in the cargo area or, exceptionally, elsewhere, subject to the approval of the Administration.

16.5.2 The stowage space shall be:

- .1 cell-divided in order to avoid shifting of the bottles at sea;
- .2 made of material fully resistant to the different liquids intended to be stowed; and
- .3 equipped with adequate ventilation arrangements.

16.5.3 Samples which react with each other dangerously shall not be stowed close to each other.

16.5.4 Samples shall not be retained on board longer than necessary.

16.6 Cargoes not to be exposed to excessive heat

16.6.1 Where the possibility exists of a dangerous reaction of a cargo, such as polymerization, decomposition, thermal instability or evolution of gas, resulting from local overheating of the cargo in either the tank or associated pipelines, such cargo shall be loaded and carried adequately segregated from other products whose temperature is sufficiently high to initiate a reaction of such cargo (see 7.1.5.4).

16.6.2 Heating coils in tanks carrying this product shall be blanked off or secured by equivalent means.

16.6.3 Heat-sensitive products shall not be carried in deck tanks which are not insulated.

16.6.4 In order to avoid elevated temperatures, this cargo shall not be carried in deck tanks.

Summary of Minimum Requirements

Chapter 17

Mixtures of noxious liquid substances presenting pollution hazards only, and which are assessed or provisionally assessed under regulation 6.3 of MARPOL Annex II, may be carried under the requirements of the Code applicable to the appropriate position of the entry in this chapter for Noxious Liquid Substances, not otherwise specified (n.o.s).

EXPLANATORY NOTES

Product name (column a)	The product name shall be used in the shipping document for any cargo offered for bulk shipments. Any additional name may be included in brackets after the product name. In some the product names are not identical with the names given in previous issues of the Code.		
UN Number (column b)	Deleted		
Pollution category (column c)	The letter X, Y, Z means the Pollution Category assigned to each product under MARPOL Annex II		
Hazards (column d)	"S" means that the product is included in the Code because of its safety hazards; "P" means that the product is included in the Code because of its pollution hazards; and "S/P" means that the product is included in the Code because of both its safety and pollution hazards.		
Ship type (column e)	1:	ship type 1 (2.1.2.1)	
	2:	ship type 2 (2.1.2.2)	
	3:	ship type 3 (2.1.2.3)	
Tank type (column f)	1:	independent tank (4.1.1)	
	2:	integral tank (4.1.2)	
	G:	gravity tank (4.1.3)	
	P:	pressure tank (4.1.4)	
Tank vents (column g)	Cont.:	controlled venting	
	Open:	open venting	
Tank environmental control (column h)	Inert:	inerting (9.1.2.1)	
	Pad:	liquid or gas padding (9.1.2.2)	
	Dry:	drying (9.1.2.3)	
	Vent:	natural or forced ventilation (9.1.2.4)	
	No:	no special requirements under this Code	
Electrical equipment (column i)	Temperature environmental classes (i')	T1 to T6	
		—	indicates no requirements
	Apparatus group (i'')	blank	no information
		IIA, IIB or IIC:	
	Flash point (i''')	—	indicates no requirements
		blank	no information
		Yes:	flashpoint exceeding 60°C (10.1.6)
		No:	flashpoint not exceeding 60°C (10.1.6)
		NF:	nonflammable product (10.1.6)

LR 17(a) Where a blank is indicated in the table, evidence of the temperature class and apparatus group is to be submitted where carriage is contemplated.

Gauging (column j)	O:	open gauging (13.1.1.1)	
	R:	restricted gauging (13.1.1.2)	
	C:	closed gauging (13.1.1.3)	
Vapour detection (column k)	F:	flammable vapours	
	T:	toxic vapours	
	No:	indicates no special requirements under this Code	
Fire protection (column l)	A:	alcohol-resistant foam or multi-purpose foam	
	B:	regular foam; encompasses all foams that are not of an alcohol-resistant type, including fluoro-protein and aqueous-film-forming foam (AFFF)	
	C:	water-spray	
	D:	dry chemical	
	No:	no special requirements under this Code	
Materials of construction (column m)	Deleted		

Summary of Minimum Requirements

Chapter 17

LR 17(b) Many of the products listed are not compatible with certain rubbers and plastics. The manufacturer's advice should be sought concerning the suitability of proposed materials for the cargoes concerned.

Emergency equipment (column n)	Yes: see 14.3.1 No: no special requirements under this Code
Specific and operational requirements (column o)	When specific reference is made to chapters 15 and/or 16, these requirements shall be additional to the requirements in any other column

LR 17(c) The information given in columns LR 'r', LR 's' and LR 't' is for guidance purposes in assessing the suitability of arrangements, scantlings, conditions of carriage and materials.

Relative Density (column LR 'r') :	<p>Where a value is given, it may indicate the maximum relative density of a range of possible values.</p> <p>A 0,000 indicates that no relative density information has been identified for the cargo to date, some of which may exceed 1,025.</p> <p>In all cases, reference should be made to the cargo manufacturers' data sheet for confirmation of relative density.</p> <p>Attention is drawn to the requirements of Chapter LR V in connection with relative densities in excess of 1,025.</p>
Melting Point (°C)(column LR 's') :	<p>Where a value is given, it may indicate the highest melting point of a range of possible values.</p> <p>A ♦ indicates that no melting point information has been identified for the cargo to date, some of which may be above 10°C, or require carriage at a temperature exceeding 65°C, <i>see also</i> LR V.9.</p> <p>In general, heating may be required for melting points above 10°C.</p> <p>In all cases, reference should be made to the cargo manufacturers' data sheet for confirmation of melting point and carriage requirements.</p>
Boiling point (°C)(column LR 't') :	<p>Where a value is given, it may indicate the lowest boiling point of a range of possible values.</p> <p>A • indicates that no boiling point information has been identified for the cargo to date, some of which may be below 45°C.</p> <p>In all cases, reference should be made to the cargo manufacturers' data sheet for confirmation of boiling point and carriage requirements.</p> <p>Cooling may be required for boiling points below 45°C.</p> <p>For low boiling point cargoes to which Chapter 15.14 does not apply, operational measures may be necessary in order to maintain cargo temperature below the boiling point.</p>

LR 17(d) Chlorinated hydrocarbon cargoes may be highly corrosive in the presence of moisture and operational arrangements should therefore be such as to avoid such contamination.

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Acetic acid	Z	S/P	3	2G	Cont	No	T1	IIA	No	R	F	A	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.19.6, 16.2.9	1.050	17	118
Acetic anhydride	Z	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	A	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.19.6	1.060	-73	140
Acetochlor	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	1.117	◆	•
Acetone cyanohydrin	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	A	Yes	15.12, 15.13, 15.17, 15.18, 15.19, 16.6.1, 16.6.2, 16.6.3	0.930	-19	82
Acetonitrile	Z	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	A	No	15.12, 15.19.6	0.780	-46	82
Acetonitrile (Low purity grade)	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	FT	AC	No	15.2.3, 15.2.4, 15.19.6			
Acid oil mixture from soyabean, corn (maize) and sunflower oil refining	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Acrylamide solution (50% or less)	Y	S/P	2	2G	Open	No			NF	C	No	No	No	15.12.3, 15.13, 15.19.6, 16.2.9, 16.6.1	1.050	10	102
Acrylic acid	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	A	Yes	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.12.4, 15.13, 15.17, 15.19, 16.2.9, 16.6.1	1.050	8	140
Acrylonitrile	Y	S/P	2	2G	Cont	No	T1	IIB	No	C	FT	A	Yes	15.12, 15.13, 15.17, 15.19	0.800	-85	77
Acrylonitrile-Styrene copolymer dispersion in polyether polyol	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Adiponitrile	Z	S/P	3	2G	Cont	No		IIB	Yes	R	T	A	No	16.2.9	0.950	2	295
Alachlor technical (90% or more)	X	S/P	2	2G	Open	No			Yes	O	No	AC	No	15.19.6, 16.2.9	1.133	38	105
Alcohol (C9-C11) poly (2.5-9) ethoxylate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Alcohol (C6-C17) (secondary) poly(3-6)ethoxylates	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	0.950	-1	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Alcohol (C6-C17) (secondary) poly(7-12)ethoxylates	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	1.000	5	•
Alcohol (C12-C16) poly(1-6)ethoxylates	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Alcohol (C12-C16) poly(20+)ethoxylates	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Alcohol (C12-C16) poly(7-19)ethoxylates	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Alcohols (C13+)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Alcohols (C8-C11), primary, linear and essentially linear	Y	S/P	2	2G	Cont	No	—	—	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9			
Alcohols (C12-C13), primary, linear and essentially linear	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Alcohols (C14-C18), primary, linear and essentially linear	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6			
Alkanes (C6-C9)	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.000	◆	•
Iso- and cyclo-alkanes (C10-C11)	Y	P	3	2G	Cont	No	—	—	No	R	F	A	No	15.19.6			
Iso- and cyclo-alkanes (C12+)	Y	P	3	2G	Cont	No	—	—	No	R	F	A	No				
n-Alkanes (C10+)	Y	P	3	2G	Cont	No	—	—	No	R	F	A	No	15.19.6			
Alkaryl polyethers (C9-C20)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6	0.000	◆	•
Alkenyl (C11+) amide	X	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Alkenyl (C16-C20) succinic anhydride	Z	S/P	3	2G	Cont	No			Yes	C	T	No	Yes	15.12, 15.17, 15.19			
Alkyl acrylate-vinylpyridine copolymer in toluene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.900	◆	110
Alkylaryl phosphate mixtures (more than 40% Diphenyl tolyl phosphate, less than 0.02% ortho-isomers)	X	S/P	1	2G	Cont	No	T1	IIA	Yes	C	T	ABC	No	15.12, 15.17, 15.19			
Alkylated (C4-C9) hindered phenols	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	BD	No	15.19.6, 16.2.6, 16.2.9			
Alkylbenzene, alkylindane, alkylindene mixture (each C12-C17)	Z	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	0.000	◆	•
Alkyl benzene distillation bottoms	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6			
Alkylbenzene mixtures (containing at least 50% of toluene)	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Alkyl (C3-C4) benzenes	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.000	◆	•
Alkyl (C5-C8) benzenes	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.000	◆	•
Alkyl(C9+)benzenes	Y	P	3	2G	Open	No	—	—	Yes	O	No	AB	No				
Alkyl (C11-C17) benzene sulphonic acid	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Alkylbenzene sulphonic acid, sodium salt solution	Y	S/P	2	2G	Open	No	—	—	NF	O	No	No	No	15.19.6, 16.2.6, 16.2.9	1.000	15	◆
Alkyl (C12+) dimethylamine	X	S/P	1	2G	Cont	No	—	—	Yes	C	T	BCD	Yes	15.12, 15.17, 15.19			
Alkyl dithiocarbamate (C19-C35)	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Alkyldithiothiadiazole (C6-C24)	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Alkyl ester copolymer (C4-C20)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Alkyl (C8-C10)/(C12-C14):(40% or less/60% or more) polyglucoside solution (55% or less)	Y	P	3	2G	Open	No			Yes	O	No	No	No	15.19.6, 16.2.6, 16.2.9			
Alkyl (C8-C10)/(C12-C14):(60% or more/40% or less) polyglucoside solution(55% or less)	Y	P	3	2G	Open	No			Yes	O	No	No	No	16.2.6, 16.2.9	0.000	◆	•
Alkyl (C7-C9) nitrates	Y	S/P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 15.20, 16.6.1, 16.6.2, 16.6.3	0.000	◆	•
Alkyl(C7-C11)phenol poly(4-12) ethoxylate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.000	◆	•
Alkyl (C8-C40) phenol sulphide	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Alkyl (C8-C9) phenylamine in aromatic solvents	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6			
Alkyl (C9-C15) phenyl propoxylate	Z	P	3	2G	Open	No			Yes	O	No	AB	No				

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Alkyl (C8-C10) polyglucoside solution (65% or less)	Y	P	3	2G	Open	No			Yes	O	No	No	No	16.2.6			
Alkyl (C8-C10)/(C12-C14):(50%/50%) polyglucoside solution (55% or less)	Y	P	3	2G	Open	No			Yes	O	No	No	No	16.2.6, 16.2.9			
Alkyl (C12-C14) polyglucoside solution (55% or less)	Y	P	3	2G	Open	No			Yes	O	No	No	No	15.19.6, 16.2.9			
Alkyl(C10-C20, saturated and unsaturated) phosphite	Y	P	2	2G	Open	No			Yes	O	No	A	No	16.2.9			
Alkyl sulphonic acid ester of phenol	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Allyl alcohol	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	A	Yes	15.12, 15.17, 15.19	0.850	-129	97
Allyl chloride	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	A	Yes	15.12, 15.17, 15.19	0.940	-134	45
Aluminium sulphate solution	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6			
2-(2-Aminoethoxy) ethanol	Z	S/P	3	2G	Open	No			Yes	O	No	AD	No	15.19.6	1.060	12	221
Aminoethyldiethanolamine/ Aminoethylethanolamine solution	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Aminoethyl ethanolamine	Z	S/P	3	2G	Open	No	T2	IIA	Yes	O	No	A	No		1.030	-20	243
N-Aminoethylpiperazine	Z	S/P	3	2G	Cont	No			Yes	R	T	A	No	15.19.6, 16.2.9	0.980	-1	220
2-Amino-2-methyl-1-propanol	Z	P	3	2G	Open	No			Yes	O	No	A	No		0.950	-7	•
Ammonia aqueous (28% or less)	Y	S/P	2	2G	Cont	No			NF	R	T	ABC	Yes	15.19.6	0.900	-70	•
Ammonium hydrogen phosphate solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Ammonium lignosulphonate solutions	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Ammonium nitrate solution (93% or less)	Z	S/P	2	1G	Open	No			NF	O	No	No	No	15.2, 15.11.4, 15.11.6, 15.18, 15.19.6, 16.2.9	1.600	130	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment			Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C								
Ammonium polyphosphate solution	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Ammonium sulphate solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Ammonium sulphide solution (45% or less)	Y	S/P	2	2G	Cont	No			No	C	FT	A	Yes	15.12, 15.17, 15.19, 16.6.1, 16.6.2, 16.6.3	0.990	−18	38
Ammonium thiosulphate solution (60% or less)	Z	P	3	2G	Open	No			NF	O	No	No	No	16.2.9	1.500	−1	•
Amyl acetate (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.880	−70	125
n-Amyl alcohol	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Amyl alcohol, primary	Z	P	3	2G	Cont	No			No	R	F	AB	No				
sec-Amyl alcohol	Z	P	3	2G	Cont	No			No	R	F	AB	No				
tert-Amyl alcohol	Z	P	3	2G	Cont	No			No	R	F	A	No				
tert-Amyl methyl ether	X	P	2	2G	Cont	No	T3		No	R	F	A	No	15.19.6			
Aniline	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	A	No	15.12, 15.17, 15.19	1.020	−6	184
Aryl polyolefins (C11-C50)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Aviation alkylates (C8 paraffins and iso-paraffins BPT 95 – 120°C)	X	P	2	2G	Cont	No			No	R	F	B	No	15.19.6	0.700	−60	•
Barium long chain (C11-C50) alkaryl sulphonate	Y	S/P	2	2G	Open	No			Yes	O	No	AD	No	15.12.3, 15.19, 16.2.6, 16.2.9			
Benzene and mixtures having 10% benzene or more (i)	Y	S/P	3	2G	Cont	No	T1	IIA	No	C	FT	AB	No	15.12.1, 15.17, 15.19.6, 16.2.9	0.880	6	80
Benzene sulphonyl chloride	Z	S/P	3	2G	Cont	No			Yes	R	T	AD	No	15.19.6, 16.2.9	1.380	14	252
Benzenetricarboxylic acid, trioctyl ester	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Benzyl acetate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.060	−52	•
Benzyl alcohol	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.040	−15	206

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Benzyl chloride	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	AB	Yes	15.12, 15.13, 15.17, 15.19			
Brake fluid base mix: Poly(2-8)alkylene (C2-C3) glycols/Polyalkylene (C2-C10) glycols monoalkyl (C1-C4) ethers and their borate esters	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Bromochloromethane	Z	S/P	3	2G	Cont	No			NF	R	T	No	No		1.93	−88	68
Butene oligomer	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.730	◆	•
Butyl acetate (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.880	◆	•
Butyl acrylate (all isomers)	Y	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	A	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.900	−60	148
tert-Butyl alcohol	Z	P	3	2G	Cont	No			No	R	F	A	No				
Butylamine (all isomers)	Y	S/P	2	2G	Cont	No			No	R	FT	A	Yes	15.12, 15.17, 15.19.6	0.730	−50	44
Butylbenzene (all isomers)	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	−60	183
Butyl benzyl phthalate	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.120	−35	370
Butyl butyrate (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.000	◆	•
Butyl/Decyl/Cetyl/Eicosyl methacrylate mixture	Y	S/P	2	2G	Cont	No			Yes	R	No	AD	No	15.13, 15.19.6, 16.6.1, 16.6.2,	0.900	20	•
Butylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
1,2-Butylene oxide	Y	S/P	3	2G	Cont	Inert	T2	IIB	No	R	F	AC	No	15.8.1 to 15.8.7, 15.8.12, 15.8.13, 15.8.16 to 15.8.18, 15.8.19, 15.8.21, 15.8.25, 15.8.27, 15.8.29, 15.19.6	0.830	−50	63
n-Butyl ether	Y	S/P	3	2G	Cont	Inert	T4	IIB	No	R	FT	A	No	15.4.6, 15.12, 15.19.6	0.770	−95	141
Butyl methacrylate	Z	S/P	3	2G	Cont	No		IIA	No	R	FT	AD	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.880	−75	165
n-Butyl propionate	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.880	−75	145
Butyraldehyde (all isomers)	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	FT	A	No	15.19.6	0.820	−99	76

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Butyric acid	Y	S/P	3	2G	Cont	No			Yes	R	No	A	No	15.11.2 to 15.11.4, 15.11.6 to 15.11.8, 15.19.6	0.960	-5	164
gamma-Butyrolactone	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Calcium carbonate slurry	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Calcium hydroxide slurry	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Calcium hypochlorite solution (15% or less)	Y	S/P	2	2G	Cont	No			NF	R	No	No	No	15.19.6	1.140	-12	•
Calcium hypochlorite solution (more than 15%)	X	S/P	1	2G	Cont	No			NF	R	No	No	No	15.19, 16.2.9	1.200	-1	•
Calcium lignosulphonate solutions	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Calcium long-chain alkaryl sulphonate (C11-C50)	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Calcium long-chain alkyl(C5-C10) phenate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6			
Calcium long-chain alkyl(C11-C40) phenate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Calcium long-chain alkyl phenate sulphide (C8-C40)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Calcium long-chain alkyl salicylate (C13+)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6	0.000	◆	•
Calcium nitrate/ Magnesium nitrate/ Potassium chloride solution	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
epsilon-Caprolactam (molten or aqueous solutions)	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Carbolic oil	Y	S/P	2	2G	Cont	No			Yes	C	FT	A	No	15.12, 15.19.6, 16.2.9	1.060	41	200

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Carbon disulphide	Y	S/P	2	1G	Cont	Pad+inert	T6	IIC	No	C	FT	C	Yes	15.3, 15.12, 15.19	1.260	-110	46
Carbon tetrachloride	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.17, 15.19.6	1.590	-23	76
Cashew nut shell oil (untreated)	Y	S	2	2G	Cont	No			Yes	R	T	AB	No	15.19.6, 16.2.6, 16.2.9	0.950	25	•
Castor oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Cetyl/Eicosyl methacrylate mixture	Y	S/P	2	2G	Open	No			Yes	O	No	AD	No	15.13, 15.19.6, 16.2.9, 16.6.1, 16.6.2	0.860	20	370
Chlorinated paraffins (C10-C13)	X	P	1	2G	Open	No			Yes	O	No	A	No	15.19, 16.2.6	1.100	30	•
Chlorinated paraffins (C14-C17) (with 50% chlorine or more, and less than 1% C13 or shorter chains)	X	P	1	2G	Open	No	—	—	Yes	O	No	A	No	15.19			
Chloroacetic acid (80% or less)	Y	S/P	2	2G	Cont	No			NF	C	No	No	No	15.11.2, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.12.3, 15.19, 16.2.9	1.330	15	186
Chlorobenzene	Y	S/P	2	2G	Cont	No	T1	IIA	No	R	FT	AB	No	15.19.6	1.110	-45	132
Chloroform	Y	S/P	3	2G	Cont	No			NF	R	T	No	Yes	15.12, 15.19.6	1.480	-63	61
Chlorohydrins (crude)	Y	S/P	2	2G	Cont	No		IIA	No	C	FT	A	No	15.12, 15.19	1.200	-16	213

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
4-Chloro-2-methylphenoxyacetic acid, dimethylamine salt solution	Y	P	2	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	1.000	-1	•
o-Chloronitrobenzene	Y	S/P	2	2G	Cont	No			Yes	C	T	ABD	No	15.12, 15.17, 15.18, 15.19, 16.2.6, 16.2.9	1.400	32	246
1-(4-Chlorophenyl)-4,4-dimethyl-pentan-3-one	Y	P	2	2G	Open	No			Yes	O	No	ABD	No	15.19.6, 16.2.6, 16.2.9			
2- or 3-Chloropropionic acid	Z	S/P	3	2G	Open	No			Yes	O	No	A	No	15.11.2 to 15.11.4, 15.11.6 to 15.11.8, 16.2.9	1.260	40	185
Chlorosulphonic acid	Y	S/P	1	2G	Cont	No			NF	C	T	No	Yes	15.11.2 to 15.11.8, 15.12, 15.16.2, 15.19	1.750	-80	158
m-Chlorotoluene	Y	S/P	2	2G	Cont	No			No	R	FT	AB	No	15.19.6	1.080	-48	162
o-Chlorotoluene	Y	S/P	2	2G	Cont	No			No	R	FT	AB	No	15.19.6	1.070	-35	159
p-Chlorotoluene	Y	S/P	2	2G	Cont	No			No	R	FT	AB	No	15.19.6, 16.2.9	1.070	7	162
Chlorotoluenes (mixed isomers)	Y	S/P	2	2G	Cont	No			No	R	FT	AB	No	15.19.6	1.070	7	162
Choline chloride solutions	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Citric acid (70% or less)	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Coal tar	X	S/P	2	2G	Cont	No	T2	IIA	Yes	R	No	BD	No	15.19.6, 16.2.6, 16.2.9	1.300	60	•
Coal tar naphtha solvent	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	AD	No	15.19.6, 16.2.9	0.870	♦	80
Coal tar pitch (molten)	X	S/P	2	1G	Cont	No	T2	IIA	Yes	R	No	BD	No	15.19.6, 16.2.6, 16.2.9			
Cocoa butter	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Coconut oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Coconut oil fatty acid	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9	0.900	25	•
Coconut oil fatty acid methyl ester	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Copper salt of long chain (C17+) alkanolic acid	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Corn oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Cotton seed oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Creosote (coal tar)	X	S/P	2	2G	Cont	No	T2	IIA	Yes	R	T	AD	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9			
Cresols (all isomers)	Y	S/P	2	2G	Open	No	T1	IIA	Yes	O	No	AB	No	15.19.6, 16.2.9	1.040	34	191
Cresylic acid, dephenolized	Y	S/P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6	1.040	-12	250
Cresylic acid, sodium salt solution	Y	S/P	2	2G	Open	No			Yes	O	No	No	No	15.19.6, 16.2.9	1.400	-1	•
Crotonaldehyde	Y	S/P	2	2G	Cont	No	T3	IIB	No	R	FT	A	Yes	15.12, 15.17, 15.19.6	0.850	-74	102
1,5,9-Cyclododecatriene	X	S/P	1	2G	Cont	No			Yes	R	T	A	No	15.13, 15.19, 16.6.1, 16.6.2	0.890	-17	238
Cycloheptane	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.810	-13	244
Cyclohexane	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.780	7	81
Cyclohexanol	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Cyclohexanone	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	A	No	15.19.6	0.950	-31	156
Cyclohexanone, Cyclohexanol mixture	Y	S/P	3	2G	Cont	No			Yes	R	FT	A	No	15.19.6	0.950	-8	99
Cyclohexyl acetate	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.970	-65	•
Cyclohexylamine	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	FT	AC	No	15.19.6	0.860	-17	134
1,3-Cyclopentadiene dimer (molten)	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.6, 16.2.9	0.980	34	•
Cyclopentane	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.740	-94	•
Cyclopentene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.750	-135	44
p-Cymene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-74	177
Decahydronaphthalene	Y	P	2	2G	Cont	No			No	R	F	AB	No	15.19.6			
Decanoic acid	X	P	2	2G	Open	No			Yes	O	No	A	No	16.2.9	0.900	32	268
Decene	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.740	-66	172
Decyl acrylate	X	S/P	1	2G	Open	No	T3	IIA	Yes	O	No	ACD	No	15.13, 15.19, 16.6.1, 16.6.2	0.890	-100	•
Decyl alcohol (all isomers)	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9(e)	0.830	7	233
Decyloxytetrahydro-thiophene dioxide	X	S/P	2	2G	Cont	No			Yes	R	T	A	No	15.19.6, 16.2.9	1.030	-1	100

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Diacetone alcohol	Z	P	3	2G	Cont	No			No	R	F	A	No				
Dialkyl (C8-C9) diphenylamines	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Dialkyl (C7-C13) phthalates	X	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Dibromomethane	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12.3, 15.19	2.400	-52	99
Dibutylamine	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ACD	No	15.19.6	0.770	-51	161
Dibutyl hydrogen phosphonate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	0.980	-1	121
2,6-Di-tert-butylphenol	X	P	1	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19, 16.2.9			
Dibutyl phthalate	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.050	-35	340
Dichlorobenzene (all isomers)	X	S/P	2	2G	Cont	No	T1	IIA	Yes	R	T	ABD	No	15.19.6	1.300	15	•
3,4-Dichloro-1-butene	Y	S/P	2	2G	Cont	No			No	C	FT	ABC	Yes	15.12.3, 15.17, 15.19.6	1.150	-61	119
1,1-Dichloroethane	Z	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	A	Yes	15.19.6	1.170	-97	57
Dichloroethyl ether	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	A	No	15.19.6	1.220	-50	178
1,6-Dichlorohexane	Y	S/P	2	2G	Cont	No			No	R	T	AB	No	15.19.6	1.068	♦	90
2,2'-Dichloroisopropyl ether	Y	S/P	2	2G	Cont	No			Yes	R	T	ACD	No	15.12, 15.17, 15.19	1.130	v97	187
Dichloromethane	Y	S/P	3	2G	Cont	No	T1	IIA	Yes	R	T	No	No	15.19.6	1.340	-92	40
2,4-Dichlorophenol	Y	S/P	2	2G	Cont	Dry			Yes	R	T	A	No	15.19.6, 16.2.6, 16.2.9	1.400	45	210
2,4-Dichlorophenoxyacetic acid, diethanolamine salt solution	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	1.280	-1	94
2,4-Dichlorophenoxyacetic acid, dimethylamine salt solution (70% or less)	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	1.240	13	•
2,4-Dichlorophenoxyacetic acid, triisopropanolamine salt solution	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.6, 16.2.9	1.220	♦	100
1,1-Dichloropropane	Y	S/P	2	2G	Cont	No			No	R	FT	AB	No	15.12, 15.19.6	1.200	♦	88

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment			Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
1,2-Dichloropropane	Y	S/P	2	2G	Cont	No	T1	IIA	No	R	FT	AB	No	15.12, 15.19.6	1.160	-80	96
1,3-Dichloropropene	X	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AB	Yes	15.12, 15.17, 15.18, 15.19	1.230	-60	104
Dichloropropene/ Dichloropropane mixtures	X	S/P	2	2G	Cont	No			No	C	FT	ABD	Yes	15.12, 15.17 to 15.19	1.200	-70	82
2,2-Dichloropropionic acid	Y	S/P	3	2G	Cont	Dry			Yes	R	No	A	No	15.11.2, 15.11.4, 15.11.6 to 15.11.8, 15.19.6, 16.2.9	1.400	8	190
Diethanolamine	Y	S/P	3	2G	Open	No	T1	IIA	Yes	O	No	A	No	16.2.6, 16.2.9	1.090	28	269
Diethylamine	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	A	Yes	15.12, 15.19.6	0.710	-50	56
Diethylaminoethanol	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	No	15.19.6	0.880	-70	161
2,6-Diethylaniline	Y	S/P	3	2G	Open	No			Yes	O	No	BCD	No	15.19.6, 16.2.9	0.960	3	242
Diethylbenzene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.870	-30	180
Diethylene glycol dibutyl ether	Z	S/P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Diethylene glycol diethyl ether	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Diethylene glycol phthalate	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Diethylenetriamine	Y	S/P	3	2G	Open	No	T2	IIA	Yes	O	No	A	No	15.19.6	0.950	-39	207
Diethylenetriamine- pentaacetic acid, pentasodium salt solution	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Diethyl ether	Z	S/P	2	1G	Cont	Inert	T4	IIIB	No	C	FT	A	Yes	15.4, 15.14, 15.19	0.700	-118	34
Di-(2-ethylhexyl) adipate	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Di-(2-ethylhexyl) phosphoric acid	Y	S/P	2	2G	Open	No			Yes	O	No	AD	No	15.19.6	0.970	-60	200
Diethyl phthalate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.12	-40	299
Diethyl sulphate	Y	S/P	2	2G	Cont	No			Yes	C	T	A	No	15.19.6	1.180	-24	208
Diglycidyl ether of bisphenol A	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	1.160	-1	•
Diglycidyl ether of bisphenol F	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	1.160	-20	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Diheptyl phthalate	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Di-n-hexyl adipate	X	P	1	2G	Open	No			Yes	O	No	A	No	15.19	0.930	-40	•
Dihexyl phthalate	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Diisobutylamine	Y	S/P	2	2G	Cont	No			No	R	FT	ACD	No	15.12.3, 15.19.6	0.750	-77	139
Diisobutylene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.720	-93	101
Diisobutyl ketone	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
Diisobutyl phthalate	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.040	-50	327
Diisononyl adipate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Diisooctyl phthalate	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Diisopropanolamine	Z	S/P	3	2G	Open	No	T2	IIA	Yes	O	No	A	No	16.2.9	0.980	44	249
Diisopropylamine	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	A	Yes	15.12, 15.19	0.720	-80	82
Diisopropylbenzene (all isomers)	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.860	-17	210
Diisopropylnaphthalene	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
N,N-Dimethylacetamide	Z	S/P	3	2G	Cont	No	—	—	Yes	C	T	ACD	No	15.12, 15.17			
N,N-Dimethylacetamide solution (40% or less)	Z	S/P	3	2G	Cont	No			Yes	R	T	B	No	15.12.1, 15.17	1.000	-20	165
Dimethyl adipate	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	1.070	8	215
Dimethylamine solution (45% or less)	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	ACD	No	15.12, 15.19.6	0.900	-40	54
Dimethylamine solution (greater than 45% but not greater than 55%)	Y	S/P	2	2G	Cont	No			No	C	FT	ACD	Yes	15.12, 15.17, 15.19	0.800	-50	45
Dimethylamine solution (greater than 55% but not greater than 65%)	Y	S/P	2	2G	Cont	No			No	C	FT	ACD	Yes	15.12, 15.14, 15.17, 15.19	0.800	-60	30
N,N-Dimethylcyclohexylamine	Y	S/P	2	2G	Cont	No			No	R	FT	AC	No	15.12, 15.17, 15.19.6	0.850	-50	162
Dimethyl disulphide	Y	S/P	2	2G	Cont	No	T3	IIA	No	R	FT	B	No	15.12.3, 15.12.4, 15.19.6			
N,N-Dimethyldodecylamine	X	S/P	1	2G	Open	No			Yes	O	No	B	No	15.19			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Dimethylethanolamine	Y	S/P	3	2G	Cont	No	T3	IIA	No	R	FT	AD	No	15.19.6	0.890	−60	135
Dimethylformamide	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AD	No	15.19.6	0.950	−58	153
Dimethyl glutarate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.070	−37	210
Dimethyl hydrogen phosphite	Y	S/P	3	2G	Cont	No			Yes	R	T	AD	No	15.12.1, 15.19.6	1.200	◆	162
Dimethyl octanoic acid	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.890	30	•
Dimethyl phthalate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	1.190	2	282
Dimethylpolysiloxane	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
2,2-Dimethylpropane-1,3-diol (molten or solution)	Z	P	3	2G	Open	No	—	—	Yes	O	No	AB	No	16.2.9			
Dimethyl succinate	Y	P	3	2G	Open	No			Yes	O	No	A	No	16.2.9	1.120	20	195
Dinitrotoluene (molten)	X	S/P	2	2G	Cont	No			Yes	C	T	A	No	15.12, 15.17, 15.19, 15.21, 16.2.6, 16.2.9, 16.6.4	1.300	55	285
Dinonyl phthalate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Diocetyl phthalate	X	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6			
1,4-Dioxane	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	FT	A	No	15.12, 15.19, 16.2.9	1.040	12	101
Dipentene	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.850	−97	175
Diphenyl	X	P	2	2G	Open	No			Yes	O	No	B	No	15.19.6, 16.2.6, 16.2.9	1.040	70	256
Diphenylamine (molten)	Y	P	2	2G	Open	No	—	—	Yes	O	No	BD	No	15.19.6, 16.2.6, 16.2.9			
Diphenylamine, reaction product with 2,2,4-Trimethylpentene	Y	S/P	1	2G	Open	No			Yes	O	No	A	No	15.19, 16.2.6	0.000	◆	•
Diphenylamines, alkylated	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Diphenyl/Diphenyl ether mixtures	X	P	2	2G	Open	No			Yes	O	No	B	No	15.19.6, 16.2.9	1.060	12	•
Diphenyl ether	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	1.070	28	259

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Diphenyl ether/Diphenyl phenyl ether mixture	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	1.200	4	•
Diphenylmethane diisocyanate	Y	S/P	2	2G	Cont	Dry	—	—	Yes(a)	C	T(a)	ABC(b)D	No	15.12, 15.16.2, 15.17, 15.19.6, 16.2.6, 16.2.9	1.200	37	230
Diphenylol propane-epichlorohydrin resins	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Di-n-propylamine	Y	S/P	2	2G	Cont	No			No	R	FT	A	No	15.12.3, 15.19.6	0.720	-63	42
Dipropylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Dithiocarbamate ester (C7-C35)	X	P	2	2G	Open	No			Yes	O	No	AD	No	15.19.6, 16.2.9			
Ditridecyl adipate	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Ditridecyl phthalate	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Diundecyl phthalate	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Dodecane (all isomers)	Y	P	2	2G	Cont	No			No	R	F	AB	No	15.19.6			
tert-Dodecanethiol	X	S/P	1	2G	Cont	No	—	—	Yes	C	T	ABD	Yes	15.12, 15.17, 15.19			
Dodecene (all isomers)	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.760	-32	213
Dodecyl alcohol	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	0.830	24	259
Dodecylamine/Tetradecylamine mixture	Y	S/P	2	2G	Cont	No			Yes	R	T	AD	No	15.19.6, 16.2.9	0.800	21	•
Dodecylbenzene	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Dodecyl diphenyl ether disulphonate solution	X	S/P	2	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.6	1.160	25	•
Dodecyl hydroxypropyl sulphide	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6			
Dodecyl methacrylate	Z	S/P	3	2G	Open	No			Yes	O	No	A	No	15.13	0.870	-29	133

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment			Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Dodecyl/Octadecyl methacrylate mixture	Y	S/P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.13, 15.19.6, 16.2.6, 16.6.1, 16.6.2			
Dodecyl/Pentadecyl methacrylate mixture	Y	S/P	2	2G	Open	No			Yes	O	No	AD	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.860	-28	290
Dodecyl phenol	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	0.940	-2	154
Dodecyl Xylene	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Drilling brines (containing zinc salts)	X	P	2	2G	Open	No			Yes	O	No	No	No	15.19.6	2.000	-1	•
Drilling brines, including: calcium bromide solution, calcium chloride solution and sodium chloride solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Epichlorohydrin	Y	S/P	2	2G	Cont	No		IIB	No	C	FT	A	Yes	15.12, 15.17, 15.19	1.180	-25	116
Ethanolamine	Y	S/P	3	2G	Open	No	T2	IIA	Yes	O	FT	A	No	16.2.9	1.020	10	171
2-Ethoxyethyl acetate	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.970	-62	156
Ethoxylated long chain (C16+) alkyloxyalkylamine	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	AB	No	15.19.6, 16.2.9			
Ethyl acetate	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Ethyl acetoacetate	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Ethyl acrylate	Y	S/P	2	2G	Cont	No	T2	IIB	No	R	FT	A	Yes	15.13, 15.19.6, 16.6.1, 16.6.2	0.920	-71	100
Ethylamine	Y	S/P	2	1G	Cont	No	T2	IIA	No	C	FT	CD	Yes	15.12, 15.14, 15.19.6	0.690	-81	17
Ethylamine solutions (72% or less)	Y	S/P	2	2G	Cont	No			No	C	FT	AC	Yes	15.12, 15.14, 15.17, 15.19	0.800	-80	38
Ethyl amyl ketone	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
Ethylbenzene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.870	-95	136
Ethyl tert-butyl ether	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
Ethyl butyrate	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
Ethylcyclohexane	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.780	-111	•
N-Ethylcyclohexylamine	Y	S/P	2	2G	Cont	No			No	R	FT	A	No	15.19.6	0.850	-43	167
S-Ethyl dipropylthiocarbamate	Y	P	2	2G	Open	No			Yes	O	No	A	No	16.2.9			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Ethylene chlorohydrin	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	AD	Yes	15.12, 15.17, 15.19	1.200	-65	129
Ethylene cyanohydrin	Y	S/P	3	2G	Open	No		IIB	Yes	O	No	A	No	15.19.6	1.040	-46	117
Ethylenediamine	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	A	No	15.19.6, 16.2.9	0.910	11	116
Ethylenediaminetetraacetic acid, tetrasodium salt solution	Y	S/P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Ethylene dibromide	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.12, 15.19.6, 16.2.9	2.170	10	132
Ethylene dichloride	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AB	No	15.19	1.260	-36	84
Ethylene glycol	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6			
Ethylene glycol acetate	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Ethylene glycol butyl ether acetate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	0.940	-64	•
Ethylene glycol diacetate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.100	-40	188
Ethylene glycol methyl ether acetate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.010	-65	144
Ethylene glycol monoalkyl ethers	Y	S/P	3	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.000	0	•
Ethylene glycol phenyl ether	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Ethylene glycol phenyl ether/Diethylene glycol phenyl ether mixture	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Ethylene oxide/Propylene oxide mixture with an ethylene oxide content of not more than 30% by mass	Y	S/P	2	1G	Cont	Inert	T2	IIB	No	C	FT	AC	No	15.8, 15.12, 15.14, 15.19	0.870	-111	27
Ethylene-vinyl acetate copolymer (emulsion)	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Ethyl-3-ethoxypropionate	Y	P	3	2G	Cont	No			No	R	No	A	No	15.19.6	0.940	-50	165
2-Ethylhexanoic acid	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
2-Ethylhexyl acrylate	Y	S/P	3	2G	Open	No	T3	IIB	Yes	O	No	A	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.890	-80	229

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
2-Ethylhexylamine	Y	S/P	2	2G	Cont	No			No	R	FT	A	No	15.12, 15.19.6	0.790	-70	169
2-Ethyl-2-(hydroxymethyl) propane-1,3-diol (C8-C10) ester	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Ethylidene norbornene	Y	S/P	2	2G	Cont	No			No	R	FT	AD	No	15.12.1, 15.19.6	0.900	-80	148
Ethyl methacrylate	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	FT	AD	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.920	-50	120
N-Ethylmethylallylamine	Y	S/P	2	2G	Cont	No	T2	IIB	No	C	F	AC	Yes	15.12.3, 15.17, 15.19			
Ethyl propionate	Y	P	3	2G	Open	No			No	R	F	A	No	15.19.6			
2-Ethyl-3-propylacrolein	Y	S/P	3	2G	Cont	No		IIA	No	R	FT	A	No	15.19.6, 16.2.9	0.850	3	175
Ethyl toluene	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-62	162
Fatty acid (saturated C13+)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Fatty acid methyl esters (m)	Y	S/P	2	2G	Cont	No	—	—	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6			
Fatty acids, (C16+)	Y	P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6			
Fatty acids, (12+)	Y	S/P	2	2G	Cont	No	—	—	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9			
Fatty acids, (C8-C10)	Y	S/P	2	2G	Cont	No	—	—	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19, 16.2.6, 16.2.9			
Fatty acids, essentially linear, (C6-C18), 2-ethylhexyl ester	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Ferric chloride solutions	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.11, 15.19.6, 16.2.9	1.410	2	110
Ferric nitrate/Nitric acid solution	Y	S/P	2	2G	Cont	No			NF	R	T	No	Yes	15.11, 15.19	1.290	-7	•
Fish oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Fluorosilicic acid (20-30%) in water solution	Y	S/P	3	1G	Cont	No	—	—	NF	R	T	No	Yes	15.11, 15.19.6			
Formaldehyde solutions (45% or less)	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	A	Yes	15.19.6, 16.2.9	1.110	22	97
Formamide	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Formic acid	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	T(g)	A	Yes	15.11.2 to 15.11.4, 15.11.6 to 15.11.8, 15.19.6, 16.2.9	1.220	8	101
Furfural	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	A	No	15.19.6	1.200	-37	162
Furfuryl alcohol	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.130	-15	170
Glucitol/glycerol blend propoxylated (containing less than 10% amines)	Z	S/P	3	2G	Cont	No	—	—	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Glutaraldehyde solutions (50% or less)	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6	1.120	-14	188
Glycerol monooleate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Glycerol propoxylated	Z	S/P	3	2G	Cont	No	—	—	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6			
Glycerol, propoxylated and ethoxylated	Z	P	3	2G	Open	No	—	—	Yes	O	No	ABC	No				
Glycerol/sucrose blend propoxylated and ethoxylated	Z	P	3	2G	Open	No	—	—	Yes	O	No	ABC	No				
Glyceryl triacetate	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Glycidyl ester of C10 trialkylacetic acid	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.100	-62	•
Glycine, sodium salt solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Glycolic acid solution (70% or less)	Z	S/P	3	2G	Open	No	—	—	NF	O	No	No	No	15.19.6, 16.2.9			
Glyoxal solution (40% or less)	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Glyoxylic acid solution (50 % or less)	Y	S/P	3	2G	Open	No	—	—	Yes	O	No	ACD	No	15.11.2 to 15.11.4, 15.11.6 to 15.11.8, 15.19.6, 16.2.9, 16.6.1 to 16.6.3			
Glyphosate solution (not containing surfactant)	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Groundnut oil	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Heptane (all isomers)	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.720	-90	•
n-Heptanoic acid	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Heptanol (all isomers) (d)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.820	-35	156
Heptene (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.700	-120	190
Heptyl acetate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.880	-50	167
1-Hexadecylnaphthalene/ 1,4-bis(hexadecyl)- naphthalene mixture	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Hexamethylenediamine (molten)	Y	S/P	2	2G	Cont	No			Yes	C	T	C	Yes	15.12, 15.17, 15.18, 15.19.6, 16.2.9			
Hexamethylenediamine adipate (50% in water)	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Hexamethylenediamine solution	Y	S/P	3	2G	Cont	No			Yes	R	T	A	No	15.19.6	0.900	41	123

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Hexamethylene diisocyanate	Y	S/P	2	1G	Cont	Dry	T1	IIB	Yes	C	T	AC(b)D	Yes	15.12, 15.16.2, 15.17, 15.18, 15.19			
Hexamethylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Hexamethyleneimine	Y	S/P	2	2G	Cont	No			No	R	FT	AC	No	15.19.6	0.880	-37	138
Hexane (all isomers)	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.600	-95	•
1,6-Hexanediol, distillation overheads	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.12.3, 15.12.4, 15.19.6, 16.2.9			
Hexanoic acid	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Hexanol	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Hexene (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.700	-100	69
Hexyl acetate	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-63	164
Hydrochloric acid	Z	S/P	3	1G	Cont	No			NF	R	T	No	Yes	15.11	2.100	-76	110
Hydrogen peroxide solutions (over 60% but not over 70% by mass)	Y	S/P	2	2G	Cont	No			NF	C	No	No	No	15.5.1, 15.19.6	1.200	-40	•
Hydrogen peroxide solutions (over 8% but not over 60% by mass)	Y	S/P	3	2G	Cont	No			NF	C	No	No	No	15.5.2, 15.18, 15.19.6	1.200	-50	•
2-Hydroxyethyl acrylate	Y	S/P	2	2G	Cont	No			Yes	C	T	A	No	15.12, 15.13, 15.19.6, 16.6.1, 16.6.2	1.100	-30	•
N-(Hydroxyethyl) Ethylenediaminetri-acetic acid, trisodium salt solution	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6			
2-Hydroxy-4-(methylthio)butanoic acid	Z	P	3	2G	Open	No			Yes	O	No	A	No		1.200	-40	•
Illipe oil	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Isoamyl alcohol	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Isobutyl alcohol	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Isobutyl formate	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Isobutyl methacrylate	Z	P	3	2G	Cont	No	—	—	No	R	F	A	No	15.12, 15.13, 15.17, 16.6.1, 16.6.2			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Isophorone	Y	S/P	3	2G	Cont	No			Yes	R	No	A	No	15.19.6			
Isophoronediamine	Y	S/P	3	2G	Cont	No			Yes	R	T	A	No	16.2.9	0.920	10	247
Isophorone diisocyanate	X	S/P	2	2G	Cont	Dry			Yes	C	T	ABD	No	15.12, 15.16.2, 15.17, 15.19.6	1.060	-60	310
Isoprene	Y	S/P	3	2G	Cont	No	T3	IIB	No	R	F	B	No	15.13, 15.14, 15.19.6, 16.6.1, 16.6.2	0.680	-146	34
Isopropanolamine	Y	S/P	3	2G	Open	No	T2	IIA	Yes	O	FT	A	No	15.19.6, 16.2.6, 16.2.9	0.960	2	159
Isopropyl acetate	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Isopropylamine	Y	S/P	2	2G	Cont	No	T2	IIA	No	C	FT	CD	Yes	15.12, 15.14, 15.19	0.690	-95	32
Isopropylamine (70% or less) solution	Y	S/P	2	2G	Cont	No			No	C	FT	CD	Yes	15.12, 15.19.6, 16.2.9	0.78	-78	48
Isopropylcyclohexane	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.800	-90	•
Isopropyl ether	Y	S/P	3	2G	Cont	Inert			No	R	F	A	No	15.4.6, 15.13.3, 15.19.6	0.720	-88	67
Lactic acid	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Lactonitrile solution (80% or less)	Y	S/P	2	1G	Cont	No			Yes	C	T	ACD	Yes	15.12, 15.13, 15.17 to 15.19, 16.6.1, 16.6.2, 16.6.3	0.990	-40	182
Lard	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Latex, ammonia (1% or less) - inhibited	Y	S/P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Latex: Carboxylated styrene-Butadiene copolymer; Styrene-Butadiene rubber	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Lauric acid	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.860	48	299
Ligninsulphonic acid, sodium salt solution	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Linseed oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Liquid chemical wastes	X	S/P	2	2G	Cont	No			No	C	FT	A	Yes	15.12, 15.19.6, 20.5.1	0.000	◆	•
Long-chain alkaryl polyether (C11-C20)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Long-chain alkaryl sulphonic acid (C16-C60)	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.9			
Long-chain alkylphen-ate/Phenol sulphide mixture	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
L-Lysine solution (60% or less)	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Magnesium chloride solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Magnesium long-chain alkaryl sulphonate (C11-C50)	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Magnesium long-chain alkyl salicylate (C11+)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Maleic anhydride	Y	S/P	3	2G	Cont	No			Yes	R	No	AC(f)	No	16.2.9	1.480	53	202
Mango kernel oil	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Mercaptobenzothiazol, sodium salt solution	X	S/P	2	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	1.250	-1	107
Mesityl oxide	Z	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	A	No	15.19.6	0.860	-59	130
Metam sodium solution	X	S/P	1	2G	Open	No			NF	O	No	No	No	15.19, 16.2.9	1.150	-1	•
Methacrylic acid	Y	S/P	3	2G	Cont	No			Yes	R	T	A	No	15.13, 15.19.6, 16.2.9, 16.6.1,	1.010	14	161
Methacrylic acid - alkoxypoly (alkylene oxide) methacrylate copolymer, sodium salt aqueous solution (45% or less)	Z	S/P	3	2G	Open	No	—	—	NF	O	No	AC	No	16.2.9			
Methacrylic resin in Ethylene dichloride	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AB	No	15.19, 16.2.9	0.000	◆	•
Methacrylonitrile	Y	S/P	2	2G	Cont	No			No	C	FT	A	Yes	15.12, 15.13, 15.17, 15.19	0.800	-36	90
3-Methoxy-1-butanol	Z	P	3	2G	Cont	No			No	R	F	A	No				
3-Methoxybutyl acetate	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
N-(2-Methoxy-1-methyl ethyl)-2-ethyl-6-methyl chloroacetanilide	X	P	1	2G	Open	No			Yes	O	No	A	No	15.19, 16.2.6	1.12	-40	282

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Methyl acetate	Z	P	3	2G	Cont	No			No	R	F	A	No				
Methyl acetoacetate	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Methyl acrylate	Y	S/P	2	2G	Cont	No	T1	IIB	No	R	FT	A	Yes	15.13, 15.19.6, 16.6.1, 16.6.2	1.020	-77	80
Methyl alcohol	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
Methylamine solutions (42% or less)	Y	S/P	2	2G	Cont	No			No	C	FT	ACD	Yes	15.12, 15.17, 15.19	0.900	-40	49
Methylamyl acetate	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-64	146
Methylamyl alcohol	Z	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.810	-90	132
Methyl amyl ketone	Z	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
Methylbutenol	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9			
Methyl tert-butyl ether	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Methyl butyl ketone	Y	P	3	2G	Cont	No			No	R	F	AB	No	15.19.6			
Methylbutynol	Z	P	3	2G	Cont	No			No	R	F	A	No				
Methyl butyrate	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.890	-90	102
Methylcyclohexane	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.770	-127	•
Methylcyclopentadiene dimer	Y	P	2	2G	Cont	No			No	R	F	B	No	15.19.6	0.980	-50	•
Methylcyclopentadienyl manganese tricarbonyl	X	S/P	1	1G	Cont	No	—	—	Yes	C	T	ABCD	Yes	15.12, 15.18, 15.19, 16.2.9			
Methyl diethanolamine	Y	S/P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	1.040	-21	•
2-Methyl-6-ethyl aniline	Y	S/P	3	2G	Open	No			Yes	O	No	AD	No	15.19.6	0.970	-25	231
Methyl ethyl ketone	Z	P	3	2G	Cont	No			No	R	F	A	No				
2-Methyl-5-ethyl pyridine	Y	S/P	3	2G	Open	No		IIA	Yes	O	No	AD	No	15.19.6	0.920	-70	178
Methyl formate	Z	S/P	2	2G	Cont	No			No	R	FT	A	Yes	15.12, 15.14, 15.19	0.980	-100	32
2-Methyl-2-hydroxy-3-butyne	Z	S/P	3	2G	Cont	No		IIA	No	R	FT	ABD	No	15.19.6, 16.2.9	0.870	3	104

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Methyl isobutyl ketone	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Methyl methacrylate	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	A	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.940	-48	101
3-Methyl-3-methoxybutanol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Methyl naphthalene (molten)	X	S/P	2	2G	Cont	No			Yes	R	No	AD	No	15.19.6	1.030	◆	•
2-Methyl-1,3-propanediol	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
2-Methylpyridine	Z	S/P	2	2G	Cont	No			No	C	F	A	No	15.12.3, 15.19.6	0.950	-64	54
3-Methylpyridine	Z	S/P	2	2G	Cont	No			No	C	F	AC	No	15.12.3, 15.19	0.960	-18	128
4-Methylpyridine	Z	S/P	2	2G	Cont	No			No	C	FT	A	No	15.12.3, 15.19, 16.2.9	0.960	4	145
N- Methyl-2-pyrrolidone	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6			
Methyl salicylate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.180	-8	223
alpha-Methylstyrene	Y	S/P	2	2G	Cont	No	T1	IIB	No	R	FT	AD(j)	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.900	-23	166
3-(methylthio)propionaldehyde	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	BC	Yes	15.12, 15.17, 15.19			
Molybdenum polysulfide long chain alkyl dithiocarbamide complex	Y	S/P	2	2G	Cont	No	—	—	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9			
Morpholine	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	F	A	No	15.19.6	1.000	-4	129
Motor fuel anti-knock compounds (containing lead alkyls)	X	S/P	1	1G	Cont	No	T4	IIA	No	C	FT	AC	Yes	15.6, 15.12, 15.18, 15.19	1.800	-30	90
Myrcene	X	P	2	2G	Cont	No	—	—	No	R	F	A	No	15.19.6, 16.2.9			
Naphthalene (molten)	X	S/P	2	2G	Cont	No	T1	IIA	Yes	R	No	AD	No	15.19.6, 16.2.9	1.150	80	218
Naphthalenesulphonic acid-Formaldehyde copolymer, sodium salt solution	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Neodecanoic acid	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.920	-40	270
Nitrating acid (mixture of sulphuric and nitric acids)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.16.2, 15.17, 15.19	1.900	-10	90
Nitric acid (70% and over)	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11, 15.19	1.500	-50	84
Nitric acid (less than 70%)	Y	S/P	2	2G	Cont	No			NF	R	T	No	Yes	15.11, 15.19	1.400	-35	122

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Nitrilotriacetic acid, trisodium salt solution	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6			
Nitrobenzene	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	AD	No	15.12, 15.17, 15.18, 15.19, 16.2.9	1.200	5	211
Nitroethane	Y	S/P	3	2G	Cont	No		IIB	No	R	FT	A(f)	No	15.19.6, 16.6.1, 16.6.2, 16.6.4	1.05	-90	114
Nitroethane(80%)/Nitropropane(20%)	Y	S/P	3	2G	Cont	No		IIB	No	R	FT	A(f)	No	15.19.6, 16.6.1, 16.6.2, 16.6.3	1.03	-90	112
Nitroethane, 1-Nitropropane (each 15% or more) mixture	Y	S/P	3	2G	Cont	No	—	—	No	R	F	A	No	15.19.6, 16.2.6, 16.6.1 to 16.6.3			
o-Nitrophenol (molten)	Y	S/P	2	2G	Cont	No			Yes	C	T	AD	No	15.12, 15.19.6, 16.2.6, 16.2.9	1.500	45	214
1- or 2-Nitropropane	Y	S/P	3	2G	Cont	No	T2	IIB	No	R	FT	A	No	15.19.6	1.000	-93	120
Nitropropane (60%)/Nitroethane (40%) mixture	Y	S/P	3	2G	Cont	No			No	R	FT	A(f)	No	15.19.6	1.010	-68	112
o- or p-Nitrotoluenes	Y	S/P	2	2G	Cont	No		IIB	Yes	C	T	AB	No	15.12, 15.17, 15.19.6	1.200	-50	222
Nonane (all isomers)	X	P	2	2G	Cont	No			No	R	F	BC	No	15.19.6	0.720	-54	•
Nonanoic acid (all isomers)	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Non-edible industrial grade palm oil	Y	S/P	2	2G	Cont	No	—	—	Yes	R	No	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9			
Nonene (all isomers)	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.730	-82	150
Nonyl alcohol (all isomers)	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.830	-5	215
Nonyl methacrylate monomer	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Nonylphenol	X	P	1	2G	Open	No			Yes	O	No	A	No	15.19, 16.2.6, 16.2.9	0.940	2	315
Nonylphenol poly(4+)ethoxylate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6	1.070	15	•
Noxious liquid, NF, (1) n.o.s. (trade name, contains) ST1, Cat. X	X	P	1	2G	Open	No	—	—	Yes	O	No	A	No	15.19, 16.2.6	—	♦	•
Noxious liquid, F, (2) n.o.s. (trade name, contains) ST1, Cat. X	X	P	1	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19, 16.2.6	—	♦	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Noxious liquid, NF, (3) n.o.s. (trade name, contains) ST2, Cat. X	X	P	2	2G	Open	No	—		Yes	O	No	A	No	15.19, 16.2.6	—	◆	•
Noxious liquid, F, (4) n.o.s. (trade name, contains) ST2, Cat. X	X	P	2	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19, 16.2.6	—	◆	•
Noxious liquid, NF, (5) n.o.s. (trade name, contains) ST2, Cat. Y	Y	P	2	2G	Open	No	—		Yes	O	No	A	No	15.19, 16.2.6, 16.2.9(l)	—	◆	•
Noxious liquid, F, (6) n.o.s. (trade name, contains) ST2, Cat. Y	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19, 16.2.6, 16.2.9(l)	—	◆	•
Noxious liquid, NF, (7) n.o.s. (trade name, contains) ST3, Cat. Y	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19, 16.2.6, 16.2.9(l)	—	◆	•
Noxious liquid, F, (8) n.o.s. (trade name, contains) ST3, Cat. Y	Y	P	3	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19, 16.2.6, 16.2.9(l)	—	◆	•
Noxious liquid, NF, (9) n.o.s. (trade name, contains) ST3, Cat. Z	Z	P	3	2G	Open	No	—		Yes	O	No	A	No		—	◆	•
Noxious liquid, F, (10) n.o.s. (trade name, contains) ST3, Cat. Z	Z	P	3	2G	Cont	No	T3	IIA	No	R	F	A	No		—	◆	•
Octane (all isomers)	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.700	−57	•
Octanoic acid (all isomers)	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Octanol (all isomers)	Y	P	2	2G	Open	No			Yes	O	No	A	No		0.830	−16	178
Octene (all isomers)	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.700	−94	120
n-Octyl acetate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	0.000	◆	•
Octyl aldehydes	Y	P	3	2G	Cont	No	—	—	No	R	F	A	No	15.19.6, 16.2.9	0.830	15	163
Octyl decyl adipate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.9			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment			Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C								
Olefin-Alkyl ester copolymer (molecular weight 2000+)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Olefin mixtures (C5-C7)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.700	-100	•
Olefin mixtures (C5-C15)	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.800	-32	•
Olefins (C13+, all isomers)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
alpha-Olefins (C6-C18) mixtures	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.800	◆	•
Oleic acid	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Oleum	Y	S/P	2	2G	Cont	No			NF	C	T	No	Yes	15.11.2 to 15.11.8, 15.12.1, 15.16.2, 15.17, 15.19, 16.2.6	0.980	-4	130
Oleylamine	X	S/P	2	2G	Cont	No			Yes	R	T	A	No	15.19.6, 16.2.9	0.828	21	100
Olive oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Oxygenated aliphatic hydro-carbon mixture	Z	S/P	3	2G	Open	No	—	—	Yes	O	No	ABC	No				
Palm acid oil	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm fatty acid distillate	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm kernel acid oil	Y	S/P	2	2G	Open	No			Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm kernel oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm kernel olein	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm kernel stearin	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm mid-fraction	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm oil fatty acid methyl ester	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.9			
Palm olein	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Palm stearin	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Paraffin wax	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Paraldehyde	Z	S/P	3	2G	Cont	No	T3	IIB	No	R	F	A	No	15.19.6, 16.2.9	0.990	13	124
Paraldehyde-ammonia reaction product	Y	S/P	2	2G	Cont	No			No	C	FT	A	No	15.12.3, 15.19			
Pentachloroethane	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12, 15.17, 15.19.6	1.680	-29	162
1,3-Pentadiene	Y	P	3	2G	Cont	No			No	R	FT	AB	No	15.13, 15.19.6, 16.6.1, 16.6.2, 16.6.3	0.680	-80	42
Pentaethylenehexamine	X	S//P	2	2G	Open	No			Yes	O	No	B	Yes	15.19			
Pentane (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.14, 15.19.6	0.630	-130	33
Pentanoic acid	Y	P	3	2G	Open	No			Yes	O	No	AB	No	15.19.6			
n-Pentanoic acid (64%)/2-Methyl butyric acid (36%) mixture	Y	S/P	2	2G	Open	No	T2		Yes	C	No	AD	No	15.11.2 to 15.11.4, 15.11.6 to 15.11.8, 15.12.3, 15.19			
Pentene (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.14, 15.19.6	0.620	-152	30
n-Pentyl propionate	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.870	-75	168
Perchloroethylene	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12.1, 15.12.2, 15.19.6	1.600	-23	121
Petrolatum	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Phenol	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	C	T	A	No	15.12, 15.19, 16.2.9	1.070	41	182
1-Phenyl-1-xylyl ethane	Y	P	3	2G	Open	No			Yes	O	No	AB	No		0.990	-50	290
Phosphate esters, alkyl (C12-C14) amine	Y	P	2	2G	Cont	No	—	—	No	R	F	A	No	15.19.6, 16.2.6, 16.2.9			
Phosphoric acid	Z	S/P	3	2G	Open	No			NF	O	No	No	No	15.11.1 to 15.11.4, 15.11.6 to 15.11.8, 16.2.9	1.700	28	200
Phosphorous, yellow or white	X	S/P	1	1G	Cont	Pad+ (vent or inert)			No(c)	C	No	C	Yes	15.7, 15.19, 16.2.9	1.800	44	282
Phthalic anhydride (molten)	Y	S/P	2	2G	Cont	No	T1	IIA	Yes	R	No	AD	No	15.19.6, 16.2.6, 16.2.9	1.500	131	285
alpha-Pinene	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	◆	●
beta-Pinene	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-40	156
Pine oil	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.930	-1	180

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Polyacrylic acid solution (40% or less)	Z	S/P	3	2G	Open	No	—	—	Yes	O	No	AC	No				
Polyalkyl (C18-C22) acrylate in xylene	Y	P	2	2G	Cont	No			No	R	F	AB	No	15.19.6, 16.2.6, 16.2.9	0.900	27	•
Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Poly(2-8)alkylene glycol monoalkyl (C1-C6) ether acetate	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Polyalkyl (C10-C20) methacrylate	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Polyalkyl (C10-C18) methacrylate/ethylene-propylene copolymer mixture	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Polybutene	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Polybutenyl succinimide	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Poly(2+)cyclic aromatics	X	P	1	2G	Cont	No			Yes	R	No	AD	No	15.19, 16.2.6, 16.2.9	0.000	◆	•
Polyether (molecular weight 1350+)	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6			
Polyethylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Polyethylene glycol dimethyl ether	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Polyethylene polyamines	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6	0.980	-1	200
Polyethylene polyamines (more than 50% C5 -C20 paraffin oil)	Y	S/P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Polyferric sulphate solution	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6	1.460	-12	108
Poly(iminoethylene)-graft-N-poly(ethyleneoxy) solution (90% or less)	Z	S/P	3	2G	Open	No	—	—	NF	O	No	AC	No	16.2.9			
Polyisobutenamine in aliphatic (C10-C14) solvent	Y	P	3	2G	Open	No	T3	IIA	Yes	O	No	A	No	15.19.6			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Electrical Equipment Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Polyisobutenyl anhydride adduct	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Poly(4+)isobutylene	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.9			
Polymethylene polyphenyl isocyanate	Y	S/P	2	2G	Cont	Dry			Yes(a)	C	T(a)	A	No	15.12, 15.16.2, 15.19.6, 16.2.9	1.200	◆	330
Polyolefin (molecular weight 300+)	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Polyolefin amide alkeneamine (C17+)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Polyolefin amide alkeneamine borate (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Polyolefinamine (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Polyolefinamine in alkyl (C2-C4) benzenes	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Polyolefinamine in aromatic solvent	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Polyolefin aminoester salts (molecular weight 2000+)	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Polyolefin anhydride	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Polyolefin ester (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Polyolefin phenolic amine (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			
Polyolefin phosphoro-sulphide, barium derivative (C28-C250)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Poly(20)oxyethylene sorbitan monooleate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Poly(5+)propylene	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.9			
Polypropylene glycol	Z	S/P	3	2G	Cont	No			Yes	O	No	ABC	No	15.19.6			
Polysiloxane	Y	P	3	2G	Cont	No			No	R	F	AB	No	15.19.6, 16.2.9			
Potassium chloride solution	Z	S/P	3	2G	Open	No	—	—	NF	O	No	A	No	16.2.9	0.000	◆	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Potassium hydroxide solution	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6	1.500	29	150
Potassium oleate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Potassium thiosulphate (50% or less)	Y	P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9			
n-Propanolamine	Y	S/P	3	2G	Open	No			Yes	O	No	AD	No	15.19.6, 16.2.9	0.980	12	188
beta-Propiolactone	Y	S/P	2	2G	Cont	No		IIA	Yes	R	T	A	No	15.19.6	1.150	-33	155
Propionaldehyde	Y	S/P	3	2G	Cont	No			No	R	FT	A	Yes	15.17, 15.19.6	0.800	-81	49
Propionic acid	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	F	A	Yes	15.11.2 to 15.11.4, 15.11.6 to 15.11.8, 15.19.6	0.990	-21	141
Propionic anhydride	Y	S/P	3	2G	Cont	No	T2	IIA	Yes	R	T	A	No	15.19.6	1.010	-45	167
Propionitrile	Y	S/P	2	1G	Cont	No	T1	IIB	No	C	FT	AD	Yes	15.12, 15.17 to 15.19	0.780	-92	97
n-Propyl acetate	Y	P	3	2G	Cont	No			No	R	F	AB	No	15.19.6			
n-propyl alcohol	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6			
n-Propylamine	Z	S/P	2	2G	Cont	Inert	T2	IIA	No	C	FT	AD	Yes	15.12, 15.19	0.720	-83	48
Propylbenzene (all isomers)	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-96	•
Propylene glycol methyl ether acetate	Z	P	3	2G	Cont	No			No	R	F	A	No				
Propylene glycol monoalkyl ether	Z	P	3	2G	Cont	No			No	R	F	AB	No				
Propylene glycol phenyl ether	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Propylene oxide	Y	S/P	2	2G	Cont	Inert	T2	IIB	No	C	FT	AC	No	15.8, 15.12.1, 15.14, 15.19	0.860	-112	34
Propylene tetramer	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.760	-32	•
Propylene trimer	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.740	-80	135
Pyridine	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	F	A	No	15.19.6	0.960	-42	115
Pyrolysis gasoline (containing benzene)	Y	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	AB	No	15.12, 15.17, 15.19.6			
Rapeseed oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Rapeseed oil (low erucic acid containing less than 4% free fatty acids)	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Rape seed oil fatty acid methyl esters	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Resin oil, distilled	Y	S/P	2	2G	Cont	No	T1	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6			
Rice bran oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Rosin	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	1.100	150	•
Safflower oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Shea butter	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Sodium alkyl (C14-C17) sulphonates (60-65% solution)	Y	P	2	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.6, 16.2.9	1.117	◆	100
Sodium aluminosilicate slurry	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Sodium benzoate	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Sodium borohydride (15% or less)/sodium hydroxide solution	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.6, 16.2.9	1.400	−4	100
Sodium carbonate solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Sodium chlorate solution (50% or less)	Z	S/P	3	2G	Open	No			NF	O	No	No	No	15.9, 15.19.6, 16.2.9	1.500	20	170
Sodium dichromate solution (70% or less)	Y	S/P	2	2G	Open	No			NF	C	No	No	No	15.12.3, 15.19	1.700	−48	120
Sodium hydrogen sulphide (6% or less)/Sodium carbonate (3% or less) solution	Z	P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	0.000	−1	•
Sodium hydrogen sulphite solution (45% or less)	Z	S/P	3	2G	Open	No			NF	O	No	No	No	16.2.9	1.300	−1	•
Sodium hydrosulphide/Ammonium sulphide solution	Y	S/P	2	2G	Cont	No			No	C	FT	A	Yes	15.12, 15.14, 15.17, 15.19, 16.6.1 to 16.6.3	1.300	−18	38
Sodium hydrosulphide solution (45% or less)	Z	S/P	3	2G	Cont	Vent or pad (gas)			NF	R	T	No	No	15.19.6, 16.2.9	1.300	40	•
Sodium hydroxide solution	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.6, 16.2.9	1.530	8	150
Sodium hypochlorite solution (15% or less)	Y	S/P	2	2G	Cont	No	—	—	NF	R	No	No	No	15.19.6	1.250	−6	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Sodium nitrite solution	Y	S/P	2	2G	Open	No			NF	O	No	No	No	15.12.3.1, 15.12.3.2, 15.19, 16.2.9	1.270	-1	•
Sodium petroleum sulphonate	Y	S/P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	1.050	-5	•
Sodium poly(4+)acrylate solutions	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No	16.2.9			
Sodium silicate solution	Y	P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	1.600	◆	•
Sodium sulphide solution (15% or less)	Y	S/P	3	2G	Cont	No			NF	C	T	No	No	15.19.6, 16.2.9	1.150	13	108
Sodium sulphite solution (25% or less)	Y	P	3	2G	Open	No			NF	O	No	No	No	15.19.6, 16.2.9	1.220	-3	103
Sodium thiocyanate solution (56% or less)	Y	P	3	2G	Open	No			Yes	O	No	No	No	15.19.6, 16.2.9	1.000	-1	•
Soyabean oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Styrene monomer	Y	S/P	3	2G	Cont	No	T1	IIA	No	R	F	AB	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.920	-30	145
Sulphohydrocarbon (C3-C88)	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Sulpholane	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9			
Sulphur (molten)	Z	S	3	1G	Open	Vent or pad (gas)	T3		Yes	O	FT	No	No	15.10, 16.2.9	1.800	115	445
Sulphuric acid	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.11, 15.16.2, 15.19.6	1.840	10	338
Sulphuric acid, spent	Y	S/P	3	2G	Open	No			NF	O	No	No	No	15.11, 15.16.2, 15.19.6	1.68	-1	•
Sulphurized fat (C14-C20)	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Sulphurized polyolefinamide alkene (C28-C250) amine	Z	P	3	2G	Open	No	—	—	Yes	O	No	A	No				
Sunflower seed oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Tall oil, crude	Y	S/P	2	2G	Cont	No			Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6	1.000	15	•
Tall oil, distilled	Y	P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
Tall oil fatty acid (resin acids less than 20%)	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6	0.900	◆	•
Tall oil pitch	Y	S/P	2	2G	Cont	No	—	—	Yes	C	T	ABC	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9			
Tallow	Y	P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Tallow fatty acid	Y	P	2	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9			
Tetrachloroethane	Y	S/P	2	2G	Cont	No			NF	R	T	No	No	15.12, 15.17, 15.19.6	1.600	−44	146
Tetraethylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Tetraethylene pentamine	Y	S/P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	1.000	−30	333
Tetrahydrofuran	Z	S	3	2G	Cont	No	T3	IIB	No	R	FT	A	No	15.19.6	0.890	−108	64
Tetrahydronaphthalene	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.980	−25	206
Tetramethylbenzene (all isomers)	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	0.900	−25	•
Titanium dioxide slurry	Z	P	3	2G	Open	No			Yes	O	No	AB	No				
Toluene	Y	P	3	2G	Cont	No			No	R	F	A	No	15.19.6	0.870	−95	111
Toluenediamine	Y	S/P	2	2G	Cont	No			Yes	C	T	AD	Yes	15.12, 15.17, 15.19, 16.2.6, 16.2.9	1.000	96	280
Toluene diisocyanate	Y	S/P	2	2G	Cont	Dry	T1	IIA	Yes	C	FT	AC(b)D	Yes	15.12, 15.16.2, 15.17, 15.19, 16.2.9	1.210	14	251
o-Toluidine	Y	S/P	2	2G	Cont	No			Yes	C	T	A	No	15.12, 15.17, 15.19	1.010	−16	200
Tributyl phosphate	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	0.980	−80	289
1,2,3-Trichlorobenzene (molten)	X	S/P	1	2G	Cont	No			Yes	C	T	ACD	Yes	15.12.1, 15, 17, 15.19, 16.2.6, 16.2.9			
1,2,4-Trichlorobenzene	X	S/P	1	2G	Cont	No			Yes	R	T	AB	No	15.19, 16.2.9	1.460	18	213
1,1,1-Trichloroethane	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6	1.400	−30	75
1,1,2-Trichloroethane	Y	S/P	3	2G	Cont	No			NF	R	T	No	No	15.12.1, 15.19.6	1.440	−36	113
Trichloroethylene	Y	S/P	2	2G	Cont	No	T2	IIA	Yes	R	T	No	No	15.12, 15.17, 15.19.6	1.470	−73	87
1,2,3-Trichloropropane	Y	S/P	2	2G	Cont	No			Yes	C	T	ABD	No	15.12, 15.17, 15.19	1.390	−15	156

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
1,1,2-Trichloro-1,2,2-Trifluoroethane	Y	P	2	2G	Open	No			NF	O	No	No	No	15.19.6	1.400	-35	48
Tricresyl phosphate (containing 1% or more ortho-isomer)	Y	S/P	1	2G	Cont	No	T2	IIA	Yes	C	No	AB	No	15.12.3, 15.19, 16.2.6	1.160	-35	440
Tricresyl phosphate (containing less than 1% ortho-isomer)	Y	S/P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	1.160	-35	420
Tridecane	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6			
Tridecanoic acid	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6, 16.2.9	0.850	◆	•
Tridecyl acetate	Y	P	3	2G	Open	No	—	—	Yes	O	No	A	No	15.19.6			
Triethanolamine	Z	S/P	3	2G	Open	No		IIA	Yes	O	No	A	No	16.2.9	1.130	19	360
Triethylamine	Y	S/P	2	2G	Cont	No	T2	IIA	No	R	FT	AC	Yes	15.12, 15.19.6	0.730	-115	89
Triethylbenzene	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.860	-70	218
Triethylenetetramine	Y	S/P	2	2G	Open	No	T2	IIA	Yes	O	No	A	No	15.19.6	0.980	-12	169
Triethyl phosphate	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Triethyl phosphite	Z	S/P	3	2G	Cont	No			No	R	FT	AB	No	15.12.1, 15.19.6, 16.2.9	0.970	-7	157
Triisopropanolamine	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Triisopropylated phenyl phosphates	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	1.400	-26	220
Trimethylacetic acid	Y	S/P	2	2G	Cont	No			Yes	R	No	A	No	15.11.2 to 15.11.8, 15.19.6, 16.2.6, 16.2.9	0.900	34	164
Trimethylamine solution (30% or less)	Z	S/P	2	2G	Cont	No			No	C	FT	AC	Yes	15.12, 15.14, 15.19, 16.2.9	0.920	5	35
Trimethylbenzene (all isomers)	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.900	-26	•
Trimethylol propane propoxy-lated	Z	S/P	3	2G	Open	No	—	—	Yes	O	No	ABC	No				
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	Z	P	3	2G	Open	No			Yes	O	No	AB	No		0.950	-60	248
2,2,4-Trimethyl-1,3-pentanediol-1-isobutyrate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6			
1,3,5-Trioxane	Y	S/P	3	2G	Cont	No			No	R	F	AD	No	15.19.6, 16.2.9	1.170	61	•

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment							Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
							Temperature class	Apparatus group	Flash point > 60°C	Gauging	Vapour detection	Fire protection	Emergency equipment				
Tripropylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Trixylyl phosphate	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.6	1.150	-33	270
Tung oil	Y	S/P	2(k)	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Turpentine	X	P	2	2G	Cont	No			No	R	F	A	No	15.19.6	0.860	-55	154
Undecanoic acid	Y	P	2	2G	Open	No			Yes	O	No	A	No	16.2.6, 16.2.9	0.890	29	•
1-Undecene	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6	0.700	-80	466
Undecyl alcohol	X	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9	0.830	20	•
Urea/Ammonium nitrate solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Urea/Ammonium nitrate solution (containing less than 1% free ammonia)	Z	S/P	3	2G	Cont	No			NF	R	T	A	No	16.2.9	1.300	◆	•
Urea/Ammonium phosphate solution	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6			
Urea solution	Z	P	3	2G	Open	No			Yes	O	No	A	No				
Valeraldehyde (all isomers)	Y	S/P	3	2G	Cont	Inert	T3	IIB	No	R	FT	A	No	15.4.6, 15.19.6	0.810	-91	103
Vegetable acid oils (m)	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Vegetable fatty acid distillates (m)	Y	S/P	2	2G	Open	No	—	—	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9			
Vinyl acetate	Y	S/P	3	2G	Cont	No	T2	IIA	No	R	F	A	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.940	-100	73
Vinyl ethyl ether	Z	S/P	2	1G	Cont	Inert	T3	IIB	No	C	FT	A	Yes	15.4, 15.13, 15.14, 15.19.6, 16.6.1, 16.6.2	0.760	-115	36
Vinylidene chloride	Y	S/P	2	2G	Cont	Inert	T2	IIA	No	R	FT	B	Yes	15.13, 15.14, 15.19.6, 16.6.1, 16.6.2	1.210	-123	-32
Vinyl neodecanoate	Y	S/P	2	2G	Open	No			Yes	O	No	AB	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.870	-20	•
Vinyltoluene	Y	S/P	2	2G	Cont	No		IIA	No	R	F	AB	No	15.13, 15.19.6, 16.6.1, 16.6.2	0.900	-77	170
Waxes	Y	P	2	2G	Open	No	—	—	Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9			

Summary of Minimum Requirements

Chapter 17

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o	LR 'r'	LR 's'	LR 't'
Product name	Pollution Category	Hazards	Ship type	Tank type	Tank vents	Tank environmental control	Electrical Equipment			Gauging	Vapour detection	Fire protection	Emergency equipment	Special and operational requirements	Relative Density	Melting Point (°C)	Boiling Point (°C)
White spirit, low (15-20%) aromatic	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9	0.750	-11	220
Xylenes	Y	P	2	2G	Cont	No			No	R	F	A	No	15.19.6, 16.2.9(h)	0.890	13	139
Xylenes/ethylbenzene (10% or more) mixture	Y	P	2	2G	Cont	No	—	—	No	R	F	A	No	15.19.6			
Xylenol	Y	S/P	2	2G	Open	No		IIA	Yes	O	No	AB	No	15.19.6, 16.2.9	1.050	55	203
Zinc alkaryl dithiophosphate (C7-C16)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6, 16.2.9	0.000	◆	•
Zinc alkenyl carboxamide	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6			
Zinc alkyl dithiophosphate (C3-C14)	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6	0.000	◆	•

- a If the product to be carried contains flammable solvents such that the flashpoint does not exceed 60°C, then special electrical systems and a flammable-vapour detector shall be provided.
- b Although water is suitable for extinguishing open-air fires involving chemicals to which this footnote applies, water shall not be allowed to contaminate closed tanks containing these chemicals because of the risk of hazardous gas generation.
- c Phosphorus, yellow or white, is carried above its autoignition temperature and therefore flashpoint is not appropriate. Electrical equipment requirements may be similar to those for substances with a flashpoint above 60°C.
- d Requirements are based on those isomers having a flashpoint of 60°C, or less; some isomers have a flashpoint greater than 60°C, and therefore the requirements based on flammability would not apply to such isomers.
- e Applies to n-decyl alcohol only.
- f Dry chemical shall not be used as fire extinguishing media.
- g Confined spaces shall be tested for both formic acid vapours and carbon monoxide gas, a decomposition product.
- h Applies to p-xylene only.
- i For mixtures containing no other components with safety hazards and where the pollution category is Y or less
- j only certain alcohol-resistant foams are effective.
- k Requirements for Ship Type identified in column e might be subject to regulation 4.1.3 of Annex II of MARPOL 73/78.
- l Applicable when the melting point is equal to or greater than 0°C.
- m From vegetable oils specified in the IBC Code.

NOTE

LR 17(e) For 55% Aqueous solution Sodium hydroxide and 50% Aqueous solution Potassium hydroxide, temperature of carriage is not to exceed 55°C and 50°C respectively. For other concentrations the maximum proposed temperature of carriage is to be submitted.

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18.1 The following are products, which have been reviewed for their safety and pollution hazards and determined not to present hazards to such an extent as to warrant application of the Code.

18.2 Although the products listed in this chapter fall outside the scope of the Code, the attention of Administrations is drawn to the fact that some safety precautions may be needed for their safe transportation. Accordingly, Administrations shall prescribe appropriate safety requirements.

18.3 Some liquid substances are identified as falling into Pollution Category Z and, therefore, subject to certain requirements of Annex II of MARPOL 73/78.

18.4 Liquid mixtures which are assessed or provisionally assessed under regulation 6.3 of MARPOL Annex II as falling into Pollution Category Z or OS, and which do not present safety hazards, may be carried under the appropriate entry in this chapter for "Noxious or Non-Noxious Liquid Substances, not otherwise specified (n.o.s.)".

EXPLANATORY NOTES

- Product name** The product name shall be used in the shipping document for any cargo offered for bulk shipments. Any additional name may be included in brackets after the product name. In some cases, the product names are not identical with the names given in previous issues of the Code.
- Pollution category** The letter Z means the Pollution Category assigned to each product under Annex II of MARPOL 73/78. OS means the product was evaluated and found to fall outside Categories X, Y, or Z.

LR 18(a) For guidance purposes in assessing the suitability of arrangements, scantlings and conditions of carriage of materials, LR can, on request, provide additional information such as:

- Flash point.
- Relative density.
- Melting and boiling points, etc.

List of Products to which the Code Does Not Apply

Chapter 18

Product Name	Pollution Category
Acetone	Z
Alcoholic beverages, n.o.s.	Z
Apple juice	OS
n-Butyl alcohol	Z
sec-Butyl alcohol	Z
Calcium nitrate solutions (50% or less)	Z
Clay slurry	OS
Coal slurry	OS
Diethylene glycol	Z
Ethyl alcohol	Z
Ethylene carbonate	Z
Glucose solution	OS
Glycerine	Z
Hexamethylenetetramine solutions	Z
Hexylene glycol	Z
Hydrogenated starch hydrolysate	OS
Isopropyl alcohol	Z
Kaolin slurry	OS
Lecithin	OS
Magnesium hydroxide slurry	Z
Maltitol solution	OS
N-Methylglucamine solution (70% or less)	Z
Methyl propyl ketone	Z
Molasses	OS
Noxious liquid, (11) n.o.s. (trade name, contains) Cat. Z	Z
Non-noxious liquid, (12) n.o.s. (trade name, contains) Cat. OS	OS
Polyaluminium chloride solution	Z
Polyglycerin, sodium salt solution (containing less than 3% sodium hydroxide)	Z
Potassium formate solutions	Z
Propylene carbonate	Z
Propylene glycol	Z
Sodium acetate solutions	Z
Sodium sulphate solutions	Z
Sorbitol solution	OS
Sulphonated polyacrylate solution	Z
Tetraethyl silicate monomer/oligomer (20% in ethanol)	Z
Triethylene glycol	Z
Vegetable protein solution (hydrolysed)	OS
Water	OS

Index of Products Carried in Bulk

Chapter 19

Sections 1 to 4

19.1 The first column of the Index of Products Carried in Bulk (hereafter referred to as “the Index”.) provides the so called Index Name. Where the Index Name is in capital and in bold, the Index Name is identical to the Product Name in either chapter 17 or chapter 18. The second column listing the relevant Product Name is therefore empty. Where the Index Name is in non-bold lower case it reflects a synonym for which the Product Name in either chapter 17 or chapter 18 is given in the second column. The relevant chapter of the IBC Code is reflected in the third column. The fourth column gives the UN Numbers of products, which were available up to February 2001.*

19.2 The Index has been developed for information purposes only. None of the Index Names indicated in non-bold lower case in the first column shall be used as Product Name on the shipping document.

19.3 Prefixes forming an integral part of the name are shown in ordinary (roman) type and are taken into account in determining the alphabetical order of entries. These include such prefixes as:

Mono Di Tri Tetra Penta Iso Bis Neo Ortho Cyclo

19.4 Prefixes that are disregarded for purposes of alphabetical order are in italics and include the following:

n-	(normal-)
sec-	(secondary-)
tert-	(tertiary-)
o-	(ortho-)
m-	(meta-)
p-	(para-)
N-	
O-	
S-	
sym-	(symmetrical)
uns-	(unsymmetrical)
dl-	
D-	
L-	
cis-	
trans-	
(E)-	
(Z)-	
alpha-	(α -)
beta-	(β -)
gamma-	(γ -)
epsilon-	(ϵ -)
omega-	(ω)

* The reason for this decision is given in paragraph 7.10 of BLG 6/16.

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Abietic anhydride	ROSIN	17	
acedimethylamide	N,N-DIMETHYLACETAMIDE	17	
Acetaldehyde cyanohydrin	LACTONITRILE SOLUTION (80% OR LESS)	17	
Acetaldehyde trimer	PARALDEHYDE	17	1264
ACETIC ACID		17	
Acetic acid anhydride	ACETIC ANHYDRIDE	17	1715
Acetic acid, ethenyl ester	VINYL ACETATE	17	1301
Acetic acid, methyl ester	METHYL ACETATE	17	
Acetic acid, vinyl ester	VINYL ACETATE	17	1301
ACETIC ANHYDRIDE		17	1715
Acetic ester	ETHYL ACETATE	17	
Acetic ether	ETHYL ACETATE	17	
Acetic oxide	ACETIC ANHYDRIDE	17	1715
Acetoacetic acid, methyl ester	METHYL ACETOACETATE	17	
Acetoacetic ester	ETHYL ACETOACETATE	17	
ACETOCHLOR		17	
ACETONE		18	
ACETONE CYANOHYDRIN		17	1541
ACETONITRILE		17	1648
ACETONITRILE (LOW PURITY GRADE)		17	
Acetyl anhydride	ACETIC ANHYDRIDE	17	1715
Acetylene tetrachloride	TETRACHLOROETHANE	17	1702
Acetyl ether	ACETIC ANHYDRIDE	17	1715
Acetyl oxide	ACETIC ANHYDRIDE	17	1715
ACID OIL MIXTURE FROM SOYABEAN, CORN (MAIZE) AND SUNFLOWER OIL REFINING		17	
Acintene	BETA-PINENE	17	2368
Acroleic acid	ACRYLIC ACID	17	2218
ACRYLAMIDE SOLUTION (50% OR LESS)		17	2074
ACRYLIC ACID		17	2218
Acrylic acid, 2-hydroxyethyl ester	2-HYDROXYETHYL ACRYLATE	17	
Acrylic amide solution, 50% or less	ACRYLAMIDE SOLUTION (50% OR LESS)	17	2074
Acrylic resin monomer	METHYL METHACRYLATE	17	1247
ACRYLONITRILE		17	1093
ACRYLONITRILE-STYRENE COPOLYMER DISPERSION IN POLYETHER POLYOL		17	
Adipic acid, bis(2-ethylhexyl) ester	DI-(2-ETHYLHEXYL) ADIPATE	17	
ADIPONITRILE		17	2205
ALACHLOR TECHNICAL (90% OR MORE)		17	
Alcohol	ETHYL ALCOHOL	18	
Alcohol, C10	DECYL ALCOHOL (ALL ISOMERS)	17	
Alcohol, C11	UNDECYL ALCOHOL	17	
Alcohol, C12	DODECYL ALCOHOL	17	
Alcohol, C7	HEPTANOL (ALL ISOMERS) (D)	17	
Alcohol, C8	OCTANOL (ALL ISOMERS)	17	
Alcohol, C9	NONYL ALCOHOL (ALL ISOMERS)	17	
ALCOHOLIC BEVERAGES, N.O.S.		18	
ALCOHOL (C9-C11) POLY (2.5-9) ETHOXYLATE		17	
ALCOHOL (C6-C17) (SECONDARY) POLY(3-6)ETHOXYLATES		17	
ALCOHOL (C6-C17) (SECONDARY) POLY(7-12)ETHOXYLATES		17	
ALCOHOL (C12-C16) POLY(1-6)ETHOXYLATES		17	
ALCOHOL (C12-C16) POLY(20+)ETHOXYLATES		17	
ALCOHOL (C12-C16) POLY(7-19)ETHOXYLATES		17	
ALCOHOLS (C13+)		17	
Alcohols, C13 - C15	ALCOHOLS (C13+)	17	
ALCOHOLS (C8-C11), PRIMARY LINEAR AND ESSENTIALLY LINEAR		17	
ALCOHOLS (C12-C13), PRIMARY LINEAR AND ESSENTIALLY LINEAR		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
ALCOHOLS (C14-C18), PRIMARY LINEAR AND ESSENTIALLY LINEAR		17	
Aldehyde collidine	2-METHYL-5-ETHYL PYRIDINE	17	2300
Aldehydine	2-METHYL-5-ETHYL PYRIDINE	17	2300
ALKANES (C6-C9)		17	
ISO- AND CYCLO-ALKANES (C10-C11)		17	
ISO- AND CYCLO-ALKANES (C12+)		17	
N-ALKANES (C10+)		17	
Alkane(C10-C18)sulfonic acid, phenyl ester	ALKYL SULPHONIC ACID ESTER OF PHENOL	17	
ALKARYL POLYETHERS (C9-C20)		17	
ALKENYL (C11+) AMIDE		17	
ALKENYL (C16-C20) SUCCINIC ANHYDRIDE		17	
ALKYL ACRYLATE-VINYLPYRIDINE COPOLYMER IN TOLUENE		17	
ALKYLARYL PHOSPHATE MIXTURES (MORE THAN 40% DIPHENYL TOLYL PHOSPHATE, LESS THAN 0.02% ORTHO-ISOMERS)		17	
ALKYLATED (C4-C9) HINDERED PHENOLS		17	
ALKYLBENZENE, ALKYLINDANE, ALKYLINDENE MIXTURE (EACH C12-C17)		17	
ALKYL BENZENE DISTILLATION BOTTOMS		17	
ALKYLBENZENE MIXTURES (CONTAINING AT LEAST 50% OF TOLUENE)		17	
ALKYL (C3-C4) BENZENES		17	
ALKYL (C5-C8) BENZENES		17	
ALKYL(C9+)BENZENES		17	
ALKYL (C11-C17) BENZENE SULPHONIC ACID		17	2584, 2586
ALKYLBENZENE SULPHONIC ACID, SODIUM SALT SOLUTION		17	
ALKYL (C12+) DIMETHYLAMINE		17	2735
ALKYL DITHIOCARBAMATE (C19-C35)		17	
ALKYLDITHIOTHIAZOLE (C6-C24)		17	
ALKYL ESTER COPOLYMER (C4-C20)		17	
ALKYL (C8-C10)/(C12-C14):(40% OR LESS/60% OR MORE) POLYGLUCOSIDE SOLUTION (55% OR LESS)		17	
ALKYL (C8-C10)/(C12-C14):(60% OR MORE/40% OR LESS) POLYGLUCOSIDE SOLUTION(55% OR LESS)		17	
ALKYL (C7-C9) NITRATES		17	
2,2'- [3-(Alkyl(C16-C18)oxy)propylimino]diethanol	ETHOXYLATED LONG CHAIN (C16+) ALKYOXYALKYLAMINE	17	
ALKYL(C7-C11)PHENOL POLY(4-12) ETHOXYLATE		17	
ALKYL (C8-C40) PHENOL SULPHIDE		17	
ALKYL (C8-C9) PHENYLAMINE IN AROMATIC SOLVENTS		17	1993
ALKYL (C9-C15) PHENYL PROPOXYLATE		17	
ALKYL (C8-C10) POLYGLUCOSIDE SOLUTION (65% OR LESS)		17	
ALKYL (C8-C10)/(C12-C14):(50%/50%) POLYGLUCOSIDE SOLUTION (55% OR LESS)		17	
ALKYL (C12-C14) POLYGLUCOSIDE SOLUTION (55% OR LESS)		17	
ALKYL(C10-C20, SATURATED AND UNSATURATED) PHOSPHITE		17	
ALKYL SULPHONIC ACID ESTER OF PHENOL		17	
3-Alky(C16-C18)oxy-N,N'-bis(2-hydroxyethyl)propan-1-amine	ETHOXYLATED LONG CHAIN (C16+) ALKYOXYALKYLAMINE	17	
ALLYL ALCOHOL		17	1098
ALLYL CHLORIDE		17	1100
Aluminium silicate hydroxide	KAOLIN SLURRY	18	
ALUMINIUM SULPHATE SOLUTION		17	
Aminoacetic acid, sodium salt solution	GLYCINE, SODIUM SALT SOLUTION	17	
1-Amino-3-aminomethyl-3,5,5-trimethylcyclohexane	ISOPHORONEDIAMINE	17	2289
Aminobenzene	ANILINE	17	1547
1-Aminobutane	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
2-Aminobutane	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
Aminocyclohexane	CYCLOHEXYLAMINE	17	2357

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Aminoethane	ETHYLAMINE	17	1036
Aminoethane solutions, 72% or less	ETHYLAMINE SOLUTIONS (72% OR LESS)	17	2270
2-Aminoethanol	ETHANOLAMINE	17	2491
2-(2-AMINOETHOXY) ETHANOL		17	3055
2-(2-Aminoethylamino)ethanol	AMINOETHYL ETHANOLAMINE	17	
AMINOETHYLDIETHANOLAMINE/AMINOETHYL			
LETHANOLAMINE SOLUTION		17	
AMINOETHYL ETHANOLAMINE		17	
N-(2-aminoethyl)ethylenediamine	DIETHYLENETRIAMINE	17	2079
1-(2-Aminoethyl)piperazine	N-AMINOETHYLPIPERAZINE	17	2815
N-AMINOETHYLPIPERAZINE		17	2815
2-Aminoisobutane	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
Aminomethane	METHYLAMINE SOLUTIONS (42% OR LESS)	17	1235
Aminomethane solutions, 42% or less	METHYLAMINE SOLUTIONS (42% OR LESS)	17	1235
1-Amino-2-methylbenzene	O-TOLUIDINE	17	1708
2-Amino-1-methylbenzene	O-TOLUIDINE	17	1708
2-AMINO-2-METHYL-1-PROPANOL		17	
3-Aminomethyl-3,5,5-trimethylcyclohexylamine	ISOPHORONEDIAMINE	17	2289
Aminophen	ANILINE	17	1547
1-Aminopropane	N-PROPYLAMINE	17	1277
2-Aminopropane	ISOPROPYLAMINE	17	1221
2-Aminopropane (70% or less) solution	ISOPROPYLAMINE (70% OR LESS)		
	SOLUTION	17	
1-Aminopropan-2-ol	ISOPROPANOLAMINE	17	
1-Amino-2-propanol	ISOPROPANOLAMINE	17	
3-Aminopropan-1-ol	N-PROPANOLAMINE	17	
2-Aminotoluene	O-TOLUIDINE	17	1708
o-Aminotoluene	O-TOLUIDINE	17	1708
5-Amino-1,3,3-trimethylcyclohexylmethylamine	ISOPHORONEDIAMINE	17	2289
AMMONIA AQUEOUS (28% OR LESS)		17	2672
Ammonia water, 28% or less	AMMONIA AQUEOUS (28% OR LESS)	17	2672
AMMONIUM HYDROGEN PHOSPHATE SOLUTION		17	
Ammonium hydroxide, 28% or less	AMMONIA AQUEOUS (28% OR LESS)	17	2672
AMMONIUM LIGNOSULPHONATE SOLUTIONS		17	
AMMONIUM NITRATE SOLUTION (93% OR LESS)		17	
AMMONIUM POLYPHOSPHATE SOLUTION		17	
AMMONIUM SULPHATE SOLUTION		17	
AMMONIUM SULPHIDE SOLUTION (45% OR LESS)		17	2683
AMMONIUM THIOSULPHATE SOLUTION (60% OR LESS)		17	
AMYL ACETATE (ALL ISOMERS)		17	1104
Amyl acetate, commercial	AMYL ACETATE (ALL ISOMERS)	17	1104
n-Amyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
sec-Amyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
Amylacetic ester	AMYL ACETATE (ALL ISOMERS)	17	1104
Amyl alcohol	N-AMYL ALCOHOL	17	
N-AMYL ALCOHOL		17	
AMYL ALCOHOL, PRIMARY		17	
SEC-AMYL ALCOHOL		17	
TERT-AMYL ALCOHOL		17	
Amyl aldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
Amyl carbinol	HEXANOL	17	2282
alpha-n-Amylene	PENTENE (ALL ISOMERS)	17	
Amylene hydrate	TERT-AMYL ALCOHOL	17	
tert-Amylenes	PENTENE (ALL ISOMERS)	17	
Amyl ethyl ketone	ETHYL AMYL KETONE	17	2271
Amyl hydrate	N-AMYL ALCOHOL	17	
Amyl hydride	PENTANE (ALL ISOMERS)	17	1265
TERT-AMYL METHYL ETHER		17	1993

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
n-Amyl methyl ketone	METHYL AMYL KETONE	17	1110
n-Amyl propionate	N-PENTYL PROPIONATE	17	
Anaesthetic ether	DIETHYL ETHER	17	1155, 1993
ANILINE		17	1547
Aniline oil	ANILINE	17	1547
Anilinobenzene	DIPHENYLAMINE (MOLTEN)	17	
Anthracene oil (coal tar fraction)	COAL TAR	17	
Ant oil, artificial	FURFURAL	17	1199
APPLE JUICE		18	
Aqua fortis	NITRIC ACID (70% AND OVER)	17	2031, 2032
Argilla	KAOLIN SLURRY	18	
ARYL POLYOLEFINS (C11-C50)		17	
AVIATION ALKYLATES (C8 PARAFFINS AND ISO-PARAFFINS BPT 95 - 120°C)		17	
Azacycloheptane	HEXAMETHYLENEIMINE	17	2493
3-Azapentane-1,5-diamine	DIETHYLENETRIAMINE	17	2079
Azepane	HEXAMETHYLENEIMINE	17	2493
Azotic acid	NITRIC ACID (70% AND OVER)	17	2031, 2032
Banana oil	AMYL ACETATE (ALL ISOMERS)	17	1104
BARIUM LONG CHAIN (C11-C50) ALKARYL SULPHONATE		17	2810
Basic calcium alkyl salicylate in approximately 30% mineral oil	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17	
Battery acid	SULPHURIC ACID	17	1830
Behenyl alcohol	ALCOHOLS (C13+)	17	
Benzenamine	2-METHYL-5-ETHYL PYRIDINE	17	2300
1,2-Benzenedicarboxylic acid, diethyl ester	DIETHYL PHTHALATE	17	
1,2-Benzenedicarboxylic acid, diundecyl ester	DIUNDECYL PHTHALATE	17	
BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)		17	1114
BENZENE SULPHONYL CHLORIDE		17	2225
BENZENETRICARBOXYLIC ACID,TRIOCTYL ESTER		17	
Benzenol	PHENOL	17	2312
Benzol	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
Benzole	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
Benzophenol	PHENOL	17	2312
2-Benzothiazolethiol(, sodium salt)	MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION	17	
Benzothiazole-2-thiol(, sodium salt)	MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION	17	
(2-Benzothiazolythio) sodium solution	MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION	17	
BENZYL ACETATE		17	
BENZYL ALCOHOL		17	
Benzyl butyl phthalate	BUTYL BENZYL PHTHALATE	17	
BENZYL CHLORIDE		17	1738
Betaprone	BETA-PROPIOLACTONE	17	
Betula oil	METHYL SALICYLATE	17	
Biformyl	GLYOXAL SOLUTION (40% OR LESS)	17	
Bihexyl	DODECANE (ALL ISOMERS)	17	
Biphenyl	DIPHENYL	17	
Bis(methylcyclopentadiene)	METHYLCYCLOPENTADIENE DIMER	17	
2,5-Bis(alkyl(C7+)(thio)-1,3,4-thiadiazole	ALKYLDITHIOTHIA DIAZOLE (C6-C24)	17	
Bis(2-aminoethyl)amine	DIETHYLENETRIAMINE	17	2079
N,N'-Bis(2-aminoethyl)ethane-1,2-diamine	TRIETHYLENETETRAMINE	17	2259
N,N'-Bis(2-aminoethyl)ethylenediamine	TRIETHYLENETETRAMINE	17	2259
N,N-Bis(2-(bis(carboxymethyl)amino)ethyl)glycine, pentasodium salt	DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION	17	
Bis(2-butoxyethyl) ether	DIETHYLENE GLYCOL DIBUTYL ETHER	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
N,N- Bis(carboxymethyl)glycine trisodium salt	NITRILOTRIACETIC ACID, TRISODIUM SALT SOLUTION	17	
Bis(chloroethyl) ether	DICHLOROETHYL ETHER	17	1916
Bis(2-chloroethyl) ether	DICHLOROETHYL ETHER	17	1916
Bis(2-chloroisopropyl) ether	2,2'-DICHLOROISOPROPYL ETHER	17	2490
Bis(2-chloro-1-methylethyl) ether	2,2'-DICHLOROISOPROPYL ETHER	17	2490
1,1-Bis[4-(2,3-epoxypropoxy)phenyl]ethane	DIGLYCIDYL ETHER OF BISPHENOL A	17	
Bis[2-(2,3 epoxypropoxy)phenyl]methane	DIGLYCIDYL ETHER OF BISPHENOL F	17	
Bis(2-ethoxyethyl) ether	DIETHYLENE GLYCOL DIETHYL ETHER	17	
Bis(2-ethylhexyl) adipate	DI-(2-ETHYLHEXYL) ADIPATE	17	
Bis(2-ethylhexyl) hydrogen phosphate	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	17	1902
Bis(2-ethylhexyl) phthalate	DIOCTYL PHTHALATE	17	
Bis(2-hydroxyethyl)amine	DIETHANOLAMINE	17	
Bis(2-hydroxyethyl)ammonium 2,4-dichlorophenoxyacetate	2,4-DICHLOROPHENOXYACETIC ACID, DIETHANOLAMINE SALT SOLUTION	17	
Bis(2-hydroxyethyl) ether	DIETHYLENE GLYCOL	18	
Bis(2-hydroxypropyl)amine	DIISOPROPANOLAMINE	17	
Bis(6-methylheptyl) phthalate	DIOCTYL PHTHALATE	17	
Blackstrap molasses	MOLASSES	18	
Bolus alba	KAOLIN SLURRY	18	
BRAKE FLUID BASE MIX: POLY(2-8)ALKYLENE (C2-C3) GLYCOLS/POLYALKYLENE (C2-C10) GLYCOLS MONOALKYL (C1-C4) ETHERS AND THEIR BORATE ESTERS		17	
Bran oil	FURFURAL	17	1199
Brimstone	SULPHUR (MOLTEN)	17	2448
BROMOCHLOROMETHANE		17	
Butaldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
Butanal	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
n-Butanal	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
1,3-Butanediol	BUTYLENE GLYCOL	17	
Butane-1,3-diol	BUTYLENE GLYCOL	17	
1,4-Butanediol	BUTYLENE GLYCOL	17	
Butane -1,4-diol	BUTYLENE GLYCOL	17	
2,3-Butanediol	BUTYLENE GLYCOL	17	
Butane-2,3-diol	BUTYLENE GLYCOL	17	
Butanoic acid	BUTYRIC ACID	17	2820
Butanol	N-BUTYL ALCOHOL	18	
Butanol-1	N-BUTYL ALCOHOL	18	
1-Butanol	N-BUTYL ALCOHOL	18	
Butan-1-ol	N-BUTYL ALCOHOL	18	
2-Butanol	SEC-BUTYL ALCOHOL	18	
Butan-2-ol	SEC-BUTYL ALCOHOL	18	
Butanol acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
2-Butanol acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
1,4-Butanolide	GAMMA-BUTYROLACTONE	17	
Butan-4-olide	GAMMA-BUTYROLACTONE	17	
n-Butanol	N-BUTYL ALCOHOL	18	
sec-Butanol	SEC-BUTYL ALCOHOL	18	
tert-Butanol	TERT-BUTYL ALCOHOL	17	
2-Butanone	METHYL ETHYL KETONE	17	
Butan-2-one	METHYL ETHYL KETONE	17	
2-Butenal	CROTONALDEHYDE	17	1143
Butene dimer	OCTENE (ALL ISOMERS)	17	
BUTENE OLIGOMER		17	
1-Butoxybutane	N-BUTYL ETHER	17	1149
2-Butoxyethanol	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
2-tert-butoxyethanol	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
2-(2-Butoxyethoxy)ethanol	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
2-(2-Butoxyethoxy)ethyl acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17	
2-Butoxyethyl acetate	ETHYLENE GLYCOL BUTYL ETHER ACETATE	17	
1-Butoxypropan-2-ol	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Butyl acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
BUTYL ACETATE (ALL ISOMERS)		17	1123
n-Butyl acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
sec-Butyl acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
tert-Butyl acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
BUTYL ACRYLATE (ALL ISOMERS)		17	2348
n-Butyl acrylate	BUTYL ACRYLATE (ALL ISOMERS)	17	2348
Butyl alcohol	N-BUTYL ALCOHOL	18	
N-BUTYL ALCOHOL		18	
SEC-BUTYL ALCOHOL		18	
TERT-BUTYL ALCOHOL		17	
n-Butyl aldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
BUTYLAMINE (ALL ISOMERS)		17	1125, 1214
n-Butylamine	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
sec-Butylamine	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
tert-Butylamine	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
BUTYLBENZENE (ALL ISOMERS)		17	2709
tert-Butylbenzene	BUTYLBENZENE (ALL ISOMERS)	17	2709
BUTYL BENZYL PHTHALATE		17	
Butyl butanoate	BUTYL BUTYRATE (ALL ISOMERS)	17	
BUTYL BUTYRATE (ALL ISOMERS)		17	
n-Butyl butyrate	BUTYL BUTYRATE (ALL ISOMERS)	17	
n-Butylcarbinol	N-AMYL ALCOHOL	17	
Butyl carbitol	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Butyl carbitol acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17	
Butyl cellosolve	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Butyl cellosolve acetate	ETHYLENE GLYCOL BUTYL ETHER ACETATE	17	
BUTYL/DECYL/CETYL/EICOSYL METHACRYLATE MIXTURE		17	
Butyl/decyl/hexadecyl/icosyl methacrylate mixture	BUTYL/DECYL/CETYL/EICOSYL METHACRYLATE MIXTURE	17	
Butyl diglycol acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
BUTYLENE GLYCOL		17	
alpha-Butylene glycol	BUTYLENE GLYCOL	17	
beta-Butylene glycol	BUTYLENE GLYCOL	17	
Butylene glycol momomethyl ether	3-METHOXY-1-BUTANOL	17	
Butylene glycol monomethyl ether acetate	3-METHOXYBUTYL ACETATE	17	
Butylene oxide	TETRAHYDROFURAN	17	2056
1,2-BUTYLENE OXIDE		17	3022
Butyl ester	BUTYL ACETATE (ALL ISOMERS)	17	1123
Butyl ethanoate	BUTYL ACETATE (ALL ISOMERS)	17	1123
Butyl ether	N-BUTYL ETHER	17	1149
N-BUTYL ETHER		17	1149
Butylethylacetic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Butylethylene	HEXENE (ALL ISOMERS)	17	2370
tert-Butyl ethyl ether	ETHYL TERT-BUTYL ETHER	17	1993
iso-Butyl ketone	DIISOBUTYL KETONE	17	
BUTYL METHACRYLATE		17	
tert-Butyl methyl ether	METHYL TERT-BUTYL ETHER	17	
Butyl methyl ketone	METHYL BUTYL KETONE	17	1224
Butyl phthalate	DIBUTYL PHTHALATE	17	
N-BUTYL PROPIONATE		17	1914

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
BUTYRALDEHYDE (ALL ISOMERS)		17	1129
n-Butyraldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
BUTYRIC ACID		17	2820
n-Butyric acid	BUTYRIC ACID	17	2820
Butyric alcohol	N-BUTYL ALCOHOL	18	
Butyric aldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
GAMMA-BUTYROLACTONE		17	
Cajeputene	DIPENTENE	17	2052
Calcium alky(longchain) salicylate (overbased) in mineral oil (LOA)	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17	
Calcium alky salicylate	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17	
Calcium bis(O-alkylsalicylate)	CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)	17	
Calcium bromide / zinc bromide solution	DRILLING BRINES (CONTAINING ZINC SALTS)	17	
CALCIUM CARBONATE SLURRY		17	
CALCIUM HYDROXIDE SLURRY		17	
CALCIUM HYPOCHLORITE SOLUTION (15% OR LESS)		17	
CALCIUM HYPOCHLORITE SOLUTION (MORE THAN 15%)		17	
CALCIUM LIGNOSULPHONATE SOLUTIONS		17	
CALCIUM LONG-CHAIN ALKARYL SULPHONATE (C11-C50)		17	
CALCIUM LONG-CHAIN ALKYL(C5-C10) PHENATE		17	
CALCIUM LONG-CHAIN ALKYL(C11-C40) PHENATE		17	
CALCIUM LONG-CHAIN ALKYL PHENATE SULPHIDE (C8-C40)		17	
CALCIUM LONG-CHAIN ALKYL SALICYLATE (C13+)		17	
CALCIUM NITRATE/MAGNESIUM NITRATE/POTASSIUM CHLORIDE SOLUTION		17	
CALCIUM NITRATE SOLUTIONS (50% OR LESS)		18	1454
Cane molasses	MOLASSES	18	
Canola oil	RAPESEED OIL (LOW ERUCIC ACID, CONTAINING LESS THAN 4% FREE FATTY ACIDS)	17	
Capric acid	DECANOIC ACID	17	
Caproic acid	HEXANOIC ACID	17	
alpha-Caproic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Caprolactam	EPSILON-CAPROLACTAM (MOLTEN OR AQUEOUS SOLUTIONS)	17	
EPSILON-CAPROLACTAM (MOLTEN OR AQUEOUS SOLUTIONS)		17	
Caproyl alcohol	HEXANOL	17	2282
Capryl alcohol	OCTANOL (ALL ISOMERS)	17	
Caprylic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Caprylyl acetate	N-OCTYL ACETATE	17	
Carbamide	UREA SOLUTION	17	
Carbinol	METHYL ALCOHOL	17	
Carbitol acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE	17	
Carbitol solvent	POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER	17	
Carbolic acid	PHENOL	17	2312
CARBOLIC OIL		17	
Carbon bisulphide	CARBON DISULPHIDE	17	1131
CARBON DISULPHIDE		17	1131
CARBON TETRACHLORIDE		17	1846
Carbonyldiamide	UREA SOLUTION	17	
Carbonyldiamine	UREA SOLUTION	17	
1,3-Carbonyl dioxyp propane	PROPYLENE CARBONATE	18	
Carboxyethyliminobis(ethylenenitrilo)tetraacetic acid,pentasodium salt	DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION	17	
CASHEW NUT SHELL OIL (UNTREATED)		17	
CASTOR OIL		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Caustic potash solution	POTASSIUM HYDROXIDE SOLUTION	17	1814
Caustic soda	SODIUM HYDROXIDE SOLUTION	17	1824
Caustic soda solution	SODIUM HYDROXIDE SOLUTION	17	1824
Cellosolve acetate	2-ETHOXYETHYL ACETATE	17	1172
Cellosolve solvent	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
CETYL/EICOSYL METHACRYLATE MIXTURE		17	
Cetyl / stearyl alcohol	ALCOHOLS (C13+)	17	
China clay	KAOLIN SLURRY	18	
CHLORINATED PARAFFINS (C10-C13)		17	
CHLORINATED PARAFFINS (C14-C17) (WITH 50% CHLORINE OR MORE, AND LESS THAN 1% C13 OR SHORTER CHAINS)		17	
CHLOROACETIC ACID (80% OR LESS)		17	1750
alpha-Chloroallyl chloride	1,3-DICHLOROPROPENE	17	2047
Chloroallylene	ALLYL CHLORIDE	17	1100
CHLOROBENZENE		17	1134
Chlorobenzol	CHLOROBENZENE	17	1134
Chlorobromomethane	BROMOCHLOROMETHANE	17	
1-Chloro-2-(beta-chloroethoxy)ethane	DICHLOROETHYL ETHER	17	1916
1-Chloro-2,3-epoxypropane	EPICHLOROHYDRIN	17	2023
Chloroethanol-2	ETHYLENE CHLOROXYDRIN	17	1135
2-Chloroethanol	ETHYLENE CHLOROXYDRIN	17	1135
2-Chloro-N-ethoxymethyl-6'-ethylacet-o-toluidide	ACETOCHLOR	17	
2-Chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide	ACETOCHLOR	17	
2-Chloroethyl alcohol	ETHYLENE CHLOROXYDRIN	17	1135
beta-Chloroethyl alcohol	ETHYLENE CHLOROXYDRIN	17	1135
Chloroethyl ether	DICHLOROETHYL ETHER	17	1916
2-Chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)acet-o-toluidide	N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE	17	
2-Chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide	N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE	17	
CHLOROFORM		17	1888
CHLOROXYDRINS (CRUDE)		17	
m-Chloromethylbenzene	M-CHLOROTOLUENE	17	2238
o-Chloromethylbenzene	O-CHLOROTOLUENE	17	2238
p-Chloromethylbenzene	P-CHLOROTOLUENE	17	2238
Chloromethylethylene oxide	EPICHLOROHYDRIN	17	2023
(2-Chloro-1-methylethyl) ether	2,2'-DICHLOROISOPROPYL ETHER	17	2490
2-Chloro-1-methylethyl ether	2,2'-DICHLOROISOPROPYL ETHER	17	2490
Chloromethyloxirane	EPICHLOROHYDRIN	17	2023
4-CHLORO-2-METHYLPHENOXYACETIC ACID, DIMETHYLAMINE SALT SOLUTION		17	
1-Chloro-2-nitrobenzene	O-CHLORONITROBENZENE	17	1578
O-CHLORONITROBENZENE		17	1578
1-(4-CHLOROPHENYL)-4,4- DIMETHYLPENTAN-3-ONE		17	
2- or 3- Chloropropanoic acid	2- OR 3-CHLOROPROPIONIC ACID	17	2511
3-Chloropropene	ALLYL CHLORIDE	17	1100
2- OR 3-CHLOROPROPIONIC ACID		17	2511
alpha- or beta- Chloropropionic acid	2- OR 3-CHLOROPROPIONIC ACID	17	2511
3-Chloropropylene	ALLYL CHLORIDE	17	1100
alpha-Chloropropylene	ALLYL CHLORIDE	17	1100
Chloropropylene oxide	EPICHLOROHYDRIN	17	2023
CHLOROSULPHONIC ACID		17	1754
Chlorosulphuric acid	CHLOROSULPHONIC ACID	17	1754
3-Chlorotoluene	M-CHLOROTOLUENE	17	2238
4-Chlorotoluene	P-CHLOROTOLUENE	17	2238
alpha-Chlorotoluene	BENZYL CHLORIDE	17	1738
M-CHLOROTOLUENE		17	2238
O-CHLOROTOLUENE		17	2238

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
P-CHLOROTOLUENE		17	2238
CHLOROTOLUENES (MIXED ISOMERS)		17	2238
CHOLINE CHLORIDE SOLUTIONS		17	
Cinene	DIPENTENE	17	2052
Cinnamene	STYRENE MONOMER	17	2055
Cinnamol	STYRENE MONOMER	17	2055
cis-Butenedioic anhydride	MALEIC ANHYDRIDE	17	2215
cis-9-Octadecenoic acid	OLEIC ACID	17	
cis-1,3-Pentadiene	1,3-PENTADIENE	17	
cis-trans-1,3-Pentadiene	1,3-PENTADIENE	17	
CITRIC ACID (70% OR LESS)		17	
CLAY SLURRY		18	
Cleaning solvents	WHITE SPIRIT, LOW (15-20%) AROMATIC	17	1300
COAL SLURRY		18	
COAL TAR		17	
Coal tar distillate	COAL TAR NAPHTHA SOLVENT	17	
COAL TAR NAPHTHA SOLVENT		17	
COAL TAR PITCH (MOLTEN)		17	
COCOA BUTTER		17	
COCONUT OIL		17	
COCONUT OIL FATTY ACID		17	
COCONUT OIL FATTY ACID METHYL ESTER		17	
Colamine	ETHANOLAMINE	17	2491
Cologne spirits	ETHYL ALCOHOL	18	
Colonial spirit	METHYL ALCOHOL	17	
Colophony	ROSIN	17	
Columbian spirit	METHYL ALCOHOL	17	
Columbian spirits	METHYL ALCOHOL	17	
COPPER SALT OF LONG CHAIN (C17+) ALKANOIC ACID		17	
CORN OIL		17	
COTTON SEED OIL		17	
CREOSOTE (COAL TAR)		17	
Creosote salts	NAPHTHALENE (MOLTEN)	17	2304
CRESOLS (ALL ISOMERS)		17	2076
CRESYLIC ACID, DEPHENOLIZED		17	
Cresylic acids	CRESOLS (ALL ISOMERS)	17	2076
CRESYLIC ACID, SODIUM SALT SOLUTION		17	
Cresylols	CRESOLS (ALL ISOMERS)	17	2076
CROTONALDEHYDE		17	1143
Crotonic aldehyde	CROTONALDEHYDE	17	1143
Cumene	PROPYLBENZENE (ALL ISOMERS)	17	
Cumol	PROPYLBENZENE (ALL ISOMERS)	17	
Cyanoethylene	ACRYLONITRILE	17	1093
2-Cyano-2-propanol	ACETONE CYANOHYDRIN	17	1541
2-Cyanopropan-2-ol	ACETONE CYANOHYDRIN	17	1541
2-cyanopropene-1	METHACRYLONITRILE	17	3079
Cyclic propylene carbonate	PROPYLENE CARBONATE	18	
1,5,9-CYCLODODECATRIENE		17	
CYCLOHEPTANE		17	2241
Cyclohexamethylenimine	HEXAMETHYLENEIMINE	17	2493
CYCLOHEXANE		17	1145
CYCLOHEXANOL		17	
CYCLOHEXANONE		17	1915
CYCLOHEXANONE, CYCLOHEXANOL MIXTURE		17	
Cyclohexatriene	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
CYCLOHEXYL ACETATE		17	2243
CYCLOHEXYLAMINE		17	2357
Cyclohexyldimethylamine	N,N-DIMETHYLCYCLOHEXYLAMINE	17	2264

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Cyclohexyl(ethyl)amine	N-ETHYLCYCLOHEXYLAMINE	17	
Cyclohexyl ketone	CYCLOHEXANONE	17	1915
Cyclohexylmethane	METHYLCYCLOHEXANE	17	2296
1,3-CYCLOPENTADIENE DIMER (MOLTEN)		17	
CYCLOPENTANE		17	1146
CYCLOPENTENE		17	2246
Cyclotetramethylene oxide	TETRAHYDROFURAN	17	2056
P-CYMENE		17	2046
Cymol	P-CYMENE	17	2046
Dalapon (ISO)	2,2-DICHLOROPROPIONIC ACID	17	
Deanol	DIMETHYLETHANOLAMINE	17	2051
DECAHYDRONAPHTHALENE		17	
DECANOIC ACID		17	
Decan-1-ol	DECYL ALCOHOL (ALL ISOMERS)	17	
n-Decanol	DECYL ALCOHOL (ALL ISOMERS)	17	
Decatoic acid	DECANOIC ACID	17	
DECENE		17	
Decoic acid	DECANOIC ACID	17	
DECYL ACRYLATE		17	
Decyl alcohol	DECYL ALCOHOL (ALL ISOMERS)	17	
DECYL ALCOHOL (ALL ISOMERS)		17	
Decylbenzene	ALKYL(C9+)BENZENES	17	
Decylic acid	DECANOIC ACID	17	
Decyl octyl adipate	OCTYL DECYL ADIPATE	17	
DECYLOXYTETRAHYDROTHIOPHENE DIOXIDE		17	
1-Deoxy-1-methylamino-D-glucitol	N-METHYLGLUCAMINE SOLUTION (70% OR LESS)	18	
Detergent alkylate	ALKYL(C9+)BENZENES	17	
Diacetic ester	ETHYL ACETOACETATE	17	
Diacetone	DIACETONE ALCOHOL	17	
DIACETONE ALCOHOL		17	
Di[alkyl/alkenyl(C10-C20)] hydrogen phosphite	ALKYL(C10-C20, SATURATED AND UNSATURATED) PHOSPHITE	17	
DIALKYL (C8-C9) DIPHENYLAMINES		17	
DIALKYL (C7-C13) PHTHALATES		17	
1,2-Diaminoethane	ETHYLENEDIAMINE	17	1604
1,6-Diaminohexane	HEXAMETHYLENEDIAMINE (MOLTEN)	17	
1,6-Diaminohexane solutions	HEXAMETHYLENEDIAMINE SOLUTION	17	1783
2,6-Diaminohexanoic acid	L-LYSINE SOLUTION (60% OR LESS)	17	
Diaminotoluene	TOLUENEDIAMINE	17	1709
2,4-Diaminotoluene	TOLUENEDIAMINE	17	1709
2,6-Diaminotoluene	TOLUENEDIAMINE	17	1709
4,6-Diamino-3,5,5-trimethylcyclohex-2-enone	ISOPHORONEDIAMINE	17	2289
3,6-Diazaoctane-1,8-diamine	TRIETHYLENETETRAMINE	17	2259
1,2-Dibromoethane	ETHYLENE DIBROMIDE	17	1605
DIBROMOMETHANE		17	
DIBUTYLAMINE		17	
Dibutylbenzene-1,2-dicarboxylate	DIBUTYL PHTHALATE	17	
Dibutyl carbinol	NONYL ALCOHOL (ALL ISOMERS)	17	
Dibutylcarbitol	DIETHYLENE GLYCOL DIBUTYL ETHER	17	
Dibutyl ether	N-BUTYL ETHER	17	1149
n-Dibutyl ether	N-BUTYL ETHER	17	1149
2,2'-Dibutylethyl ether	DIETHYLENE GLYCOL DIBUTYL ETHER	17	
Dibutyl hydrogen phosphite	DIBUTYL HYDROGEN PHOSPHONATE	17	
DIBUTYL HYDROGEN PHOSPHONATE		17	
2,6-DI-TERT-BUTYLPHENOL		17	
Dibutyl phosphonate	DIBUTYL HYDROGEN PHOSPHONATE	17	
DIBUTYL PHTHALATE		17	
Dibutyl ortho-phthalate	DIBUTYL PHTHALATE	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
DICHLOROBENZENE (ALL ISOMERS)		17	
1,2-Dichlorobenzene	DICHLOROBENZENE (ALL ISOMERS)	17	
m-Dichlorobenzene	DICHLOROBENZENE (ALL ISOMERS)	17	
o-Dichlorobenzene	DICHLOROBENZENE (ALL ISOMERS)	17	
3,4-Dichlorobut-1-ene	3,4-DICHLORO-1-BUTENE	17	
3,4-DICHLORO-1-BUTENE		17	
2,2'-Dichlorodiethyl ether	DICHLOROETHYL ETHER	17	1916
Dichlorodiisopropyl ether	2,2'-DICHLOROISOPROPYL ETHER	17	2490
1,1-DICHLOROETHANE		17	2362
1,2-Dichloroethane	ETHYLENE DICHLORIDE	17	1184
1,1-Dichloroethene	VINYLDENE CHLORIDE	17	1303
Dichloroether	DICHLOROETHYL ETHER	17	1916
1,1-Dichloroethylene	VINYLDENE CHLORIDE	17	1303
DICHLOROETHYL ETHER		17	1916
2,2'-Dichloroethyl ether	DICHLOROETHYL ETHER	17	1916
Dichloroethyl oxide	DICHLOROETHYL ETHER	17	1916
1,6-DICHLOROHEXANE		17	
2,2'-DICHLOROISOPROPYL ETHER		17	2490
DICHLOROMETHANE		17	1593
2,4-DICHLOROPHENOL		17	2021
2,4-DICHLOROPHENOXYACETIC ACID, DIETHANOLAMINE SALT SOLUTION		17	
2,4-DICHLOROPHENOXYACETIC ACID, DIMETHYLAMINE SALT SOLUTION (70% OR LESS)		17	
2,4-DICHLOROPHENOXYACETIC ACID, TRIISOPROPANOLAMINE SALT SOLUTION		17	
1,1-DICHLOROPROPANE		17	
1,2-DICHLOROPROPANE		17	1279
Dichloropropane / dichloropropene mixtures	DICHLOROPROPENE/DICHLOROPROPANE MIXTURES	17	
2,2-Dichloropropanoic acid	2,2-DICHLOROPROPIONIC ACID	17	
1,3-DICHLOROPROPENE		17	2047
DICHLOROPROPENE/DICHLOROPROPANE MIXTURES		17	
2,2-DICHLOROPROPIONIC ACID		17	
Dichloropropylene	1,3-DICHLOROPROPENE	17	2047
1,4-Dicyanobutane	ADIPONITRILE	17	2205
Dicyclopentadiene	1,3-CYCLOPENTADIENE DIMER (MOLTEN)	17	
Didecyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
Didodecyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
DIETHANOLAMINE		17	
DIETHYLAMINE		17	1154
DIETHYLAMINOETHANOL		17	2686
2-Diethylaminoethanol	DIETHYLAMINOETHANOL	17	2686
2,6-DIETHYLANILINE		17	
DIETHYLBENZENE		17	2049
Diethylcarbitol	DIETHYLENE GLYCOL DIETHYL ETHER	17	
Diethyl 'carbitol'	DIETHYLENE GLYCOL DIETHYL ETHER	17	
1,4-Diethylene dioxide	1,4-DIOXANE	17	1165
Diethylene ether	1,4-DIOXANE	17	1165
DIETHYLENE GLYCOL		18	
Diethylene glycol butyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Diethylene glycol butyl ether acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
DIETHYLENE GLYCOL DIBUTYL ETHER		17	
DIETHYLENE GLYCOL DIETHYL ETHER		17	
Diethylene glycol ethyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Diethylene glycol ethyl ether acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
Diethylene glycol methyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Diethylene glycol methyl ether acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
Diethylene glycol monobutyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Diethylene glycol monobutyl ether acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
Diethylene glycol monoethyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Diethylene glycol monoethyl ether acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
Diethylene glycol monomethyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Diethylene glycol monomethyl ether acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
DIETHYLENE GLYCOL PHTHALATE		17	
Diethylene oxide	1,4-DIOXANE	17	1165
DIETHYLENETRIAMINE		17	2079
DIETHYLENETRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION		17	
N,N-Diethylethanamine	TRIETHYLAMINE	17	1296
Diethylethanolamine	DIETHYLAMINOETHANOL	17	2686
N,N-Diethylethanolamine	DIETHYLAMINOETHANOL	17	2686
DIETHYL ETHER		17	1155
N,N-Diethylethylamine	TRIETHYLAMINE	17	1296
DI-(2-ETHYLHEXYL) ADIPATE		17	
DI-(2-ETHYLHEXYL) PHOSPHORIC ACID		17	1902
Diethyl oxide	DIETHYL ETHER	17	1155
DIETHYL PHTHALATE		17	
DIETHYL SULPHATE		17	1594
Diformyl	GLYOXAL SOLUTION (40% OR LESS)	17	
DIGLYCIDYL ETHER OF BISPHENOL A		17	
DIGLYCIDYL ETHER OF BISPHENOL F		17	
Diglycol	DIETHYLENE GLYCOL	18	
Diglycolamine	2-(2-AMINOETHOXY) ETHANOL	17	3055
Diglycol phthalate	DIETHYLENE GLYCOL PHTHALATE	17	
DIHEPTYL PHTHALATE		17	
Dihexyl	DODECANE (ALL ISOMERS)	17	
DI-N-HEXYL ADIPATE		17	
DIHEXYL PHTHALATE		17	
1,3-Dihydroisobenzofuran-1,3-dione	PHTHALIC ANHYDRIDE (MOLTEN)	17	2214
2,3-Dihydroxybutane	BUTYLENE GLYCOL	17	
2,2'-Dihydroxydiethylamine	DIETHANOLAMINE	17	
Di-(2-hydroxyethyl)amine	DIETHANOLAMINE	17	
Dihydroxyethyl ether	DIETHYLENE GLYCOL	18	
Dihydroxyhexane	HEXAMETHYLENE GLYCOL	17	
1,2-Dihydroxypropane	PROPYLENE GLYCOL	18	
Diisobutene	DIISOBUTYLENE	17	2050
DIISOBUTYLAMINE		17	2361
Diisobutylcarbinol	NONYL ALCOHOL (ALL ISOMERS)	17	
DIISOBUTYLENE		17	2050
alpha-Diisobutylene	DIISOBUTYLENE	17	2050
beta-Diisobutylene	DIISOBUTYLENE	17	2050
DIISOBUTYL KETONE		17	
DIISOBUTYL PHTHALATE		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
2,4-diisocyanato-1-methylbenzene	TOLUENE DIISOCYANATE	17	2078
2,4-Diisocyanatotoluene	TOLUENE DIISOCYANATE	17	2078
Diisodecyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
DIISONONYL ADIPATE		17	
Diisononyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
DIISOCTYL PHTHALATE		17	
DIISOPROPANOLAMINE		17	
Diisopropylacetone	DIISOBUTYL KETONE	17	
DIISOPROPYLAMINE		17	1158
DIISOPROPYLBENZENE (ALL ISOMERS)		17	
Diisopropyl ether	ISOPROPYL ETHER	17	1159
DIISOPROPYLNAPHTHALENE		17	3082
Diisopropyl oxide	ISOPROPYL ETHER	17	1159
N,N-DIMETHYLACETAMIDE		17	
N,N-DIMETHYLACETAMIDE SOLUTION (40% OR LESS)		17	
Dimethylacetylene carbinol	2-METHYL-2-HYDROXY-3-BUTYNE	17	
DIMETHYL ADIPATE		17	
DIMETHYLAMINE SOLUTION (45% OR LESS)		17	1160
DIMETHYLAMINE SOLUTION (GREATER THAN 45% BUT NOT GREATER THAN 55%)		17	1160
DIMETHYLAMINE SOLUTION (GREATER THAN 55% BUT NOT GREATER THAN 65%)		17	1160
Dimethylaminoethanol	DIMETHYLETHANOLAMINE	17	2051
2-Dimethylaminoethanol	DIMETHYLETHANOLAMINE	17	2051
Dimethylbenzenes	XYLENES	17	1307
1,3-Dimethylbutanol	METHYLAMYL ALCOHOL	17	2053
1,3-Dimethylbutan-1-ol	METHYLAMYL ALCOHOL	17	2053
1,3-Dimethylbutyl acetate	METHYLAMYL ACETATE	17	1233
Dimethylcarbinol	ISOPROPYL ALCOHOL	18	
N,N-DIMETHYLCYCLOHEXYLAMINE		17	2264
DIMETHYL DISULPHIDE		17	2381
N,N-Dimethyldodecanamine	ALKYL (C12+) DIMETHYLAMINE	17	2735
N,N-Dimethyldodecan-1-amine	N,N-DIMETHYLDODECYLAMINE	17	
N,N-DIMETHYLDODECYLAMINE		17	
1,1-Dimethylethanol	TERT-BUTYL ALCOHOL	17	
DIMETHYLETHANOLAMINE		17	2051
1,1-Dimethylethyl alcohol	TERT-BUTYL ALCOHOL	17	
Dimethyl ethyl carbinol	TERT-AMYL ALCOHOL	17	
1,1-dimethylethyl methyl ether	METHYL TERT-BUTYL ETHER	17	
Dimethyl formaldehyde	ACETONE	18	
DIMETHYLFORMAMIDE		17	2265
DIMETHYL GLUTARATE		17	
2,6-Dimethylheptan-4-one	DIISOBUTYL KETONE	17	
2,6-Dimethyl-4-heptanone	DIISOBUTYL KETONE	17	
N,N-Dimethylhexanamine	ALKYL (C12+) DIMETHYLAMINE	17	2735
DIMETHYL HYDROGEN PHOSPHITE		17	
Dimethylhydroxybenzenes	XYLENOL	17	2261
1,1'-Dimethyl-2,2'-iminodiethanol	DIISOPROPANOLAMINE	17	
Dimethyl ketal	ACETONE	18	
Dimethyl ketone	ACETONE	18	
Dimethylaurylamine	N,N-DIMETHYLDODECYLAMINE	17	
N,N-Dimethylmethanamine	TRIMETHYLAMINE SOLUTION (30% OR LESS)	17	1297
N,N-Dimethylmethylamine	TRIMETHYLAMINE SOLUTION (30% OR LESS)	17	1297
6,6-Dimethyl-2-methylenebicyclo[3.1.1]heptane	BETA-PINENE	17	2368
DIMETHYL OCTANOIC ACID		17	
2,2-Dimethyloctanoic acid	NEODECANOIC ACID	17	
2,3-Dimethylphenol	XYLENOL	17	2261
2,4-Dimethylphenol	XYLENOL	17	2261
2,5-Dimethylphenol	XYLENOL	17	2261

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
2,6-Dimethylphenol	XYLENOL	17	2261
3,4-Dimethylphenol	XYLENOL	17	2261
3,5-Dimethylphenol	XYLENOL	17	2261
Dimethylphenols	XYLENOL	17	2261
Dimethylphenyl phosphate (3:1)	TRIXYL PHOSPHATE	17	
DIMETHYL PHTHALATE		17	
DIMETHYLPOLYSILOXANE		17	
2,2-Dimethylpropane	PENTANE (ALL ISOMERS)	17	1265
2,2-DIMETHYLPROPANE-1,3-DIOL (MOLTEN OR SOLUTION)		17	
2,2-Dimethylpropanoic acid	TRIMETHYLACETIC ACID	17	
1,1-Dimethylpropargyl alcohol	2-METHYL-2-HYDROXY-3-BUTYNE	17	
2,2-Dimethylpropionic acid	TRIMETHYLACETIC ACID	17	
1,1-Dimethylpropynol	2-METHYL-2-HYDROXY-3-BUTYNE	17	
DIMETHYL SUCCINATE		17	
N,N-Dimethyltetradecanamine	ALKYL (C12+) DIMETHYLAMINE	17	2735
Dimethyltetradecylamine	ALKYL (C12+) DIMETHYLAMINE	17	2735
dimethyl-p-tolyloxy {poly[oxy-p-phenyleneisopropylidene-p-phenylenoxy(2-hydroxytrimethylene)]}	DIGLYCIDYL ETHER OF BISPHENOL A	17	
3,9-Dimethyltricyclo[5.2.1.0;2,6]deca-3,8-diene	METHYLCYCLOPENTADIENE DIMER	17	
Dimethyltrimethylene glycol	2,2-DIMETHYLPROPANE-1,3-DIOL (MOLTEN OR SOLUTION)	17	
	N,N-DIMETHYLACETAMIDE	17	
Dimethylacetamide acetate		17	1600
DINITROTOLUENE (MOLTEN)		17	
DINONYL PHTHALATE		17	
Dinonyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
3,6-Dioxaoctane-1,8-diol	TRIETHYLENE GLYCOL	18	
Diocetyl adipate	DI-(2-ETHYLHEXYL) ADIPATE	17	
Diocetyl hydrogen phosphate	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	17	1902
Diocetyl phosphoric acid	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	17	1902
DIOCTYL PHTHALATE		17	
2,4-D-diollamine	2,4-DICHLOROPHENOXYACETIC ACID, DIETHANOLAMINE SALT SOLUTION	17	
	1,4-DIOXANE	17	1165
1,4-Dioxan		17	1165
1,4-DIOXANE		17	
Dioxolanone	PROPYLENE CARBONATE	18	
1,3-Dioxolan-2-one	ETHYLENE CARBONATE	18	
Dioxolone-2	ETHYLENE CARBONATE	18	
1,1-Dioxothiolan	SULPHOLANE	17	
Dioxyethylene ether	1,4-DIOXANE	17	1165
DIPENTENE		17	2052
DIPHENYL		17	
DIPHENYLAMINE (MOLTEN)		17	
DIPHENYLAMINE, REACTION PRODUCT WITH 2,2,4-TRIMETHYLPENTENE		17	
DIPHENYLAMINES, ALKYLATED		17	
DIPHENYL/DIPHENYL ETHER MIXTURES		17	
Diphenyl/diphenyl oxide mixtures	DIPHENYL/DIPHENYL ETHER MIXTURES	17	
Diphenyl dodecyl ether disulphonate solution	DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION	17	
	DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION	17	
Diphenyl dodecyl oxide disulphonate solution		17	
DIPHENYL ETHER		17	
DIPHENYL ETHER/DIPHENYL PHENYL ETHER MIXTURE		17	
DIPHENYLMETHANE DIISOCYANATE		17	2489
DIPHENYLOL PROPANE-EPICHLOROHYDRIN RESINS		17	
Diphenyl oxide	DIPHENYL ETHER	17	
Diphenyl oxide / diphenyl phenyl ether mixture	DIPHENYL ETHER/DIPHENYL PHENYL ETHER MIXTURE	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Dipropylamine	DI-N-PROPYLAMINE	17	2383
n-Dipropylamine	DI-N-PROPYLAMINE	17	2383
DI-N-PROPYLAMINE		17	2383
DIPROPYLENE GLYCOL		17	
Dipropylene glycol methyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Dipropylene glycol monomethyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Disodium carbonate	SODIUM CARBONATE SOLUTION	17	
Distillates (Petroleum), Steam Cracked, C8 - C12 Fraction	RESIN OIL, DISTILLED	17	
DITHIOCARBAMATE ESTER (C7-C35)		17	
DITRIDECYL ADIPATE		17	
DITRIDECYL PHTHALATE		17	
DIUNDECYL PHTHALATE		17	
dl-Lactic acid	LACTIC ACID	17	
dl-p-Mentha-1,8-diene	DIPENTENE	17	2052
1-Docosanol	ALCOHOLS (C13+)	17	
Docosan-1-ol	ALCOHOLS (C13+)	17	
DODECANE (ALL ISOMERS)		17	
TERT-DODECANETHIOL		17	
Dodecanoic acid	LAURIC ACID	17	
1-Dodecanol	DODECYL ALCOHOL	17	
Dodecan-1-ol	DODECYL ALCOHOL	17	
n-Dodecanol	DODECYL ALCOHOL	17	
DODECENE (ALL ISOMERS)		17	
DODECYL ALCOHOL		17	
n-Dodecyl alcohol	DODECYL ALCOHOL	17	
DODECYLAMINE/TETRADECYLAMINE MIXTURE		17	
DODECYLBENZENE		17	
Dodecylbenzenesulphonic acid (contains 1.5% sulphuric acid)	ALKYL (C11-C17) BENZENE SULPHONIC ACID	17	2584, 2586
Dodecyl dimethylamine	ALKYL (C12+) DIMETHYLAMINE	17	2735
DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION		17	
Dodecyl diphenyl oxide disulphonate solution	DODECYL DIPHENYL ETHER DISULPHONATE SOLUTION	17	
Dodecylene	DODECENE (ALL ISOMERS)	17	
DODECYL HYDROXYPROPYL SULPHIDE		17	
Dodecylic acid	LAURIC ACID	17	
tert-Dodecyl mercaptan	TERT-DODECANETHIOL	17	
DODECYL METHACRYLATE		17	
Dodecyl-2-methyl-2-propenoate	DODECYL METHACRYLATE	17	
Dodecyl-2-methylprop-2-enoate	DODECYL METHACRYLATE	17	
DODECYL/OCTADECYL METHACRYLATE (MIXTURE)		17	
DODECYL/PENTADECYL METHACRYLATE MIXTURE		17	
DODECYL PHENOL		17	
Dodecyl, Tetradecyl, hexadecyl-dimethylamine mixture	ALKYL (C12+) DIMETHYLAMINE	17	2735
2-Dodecylthio-1-methylethanol	DODECYL HYDROXYPROPYL SULPHIDE	17	
1-Dodecylthioprop-2-ol	DODECYL HYDROXYPROPYL SULPHIDE	17	
DODECYL XYLENE		17	
Drilling brine: potassium chloride solution	POTASSIUM CHLORIDE SOLUTION	17	
DRILLING BRINES (CONTAINING ZINC SALTS)		17	
DRILLING BRINES, INCLUDING:CALCIUM BROMIDE SOLUTION, CALCIUM CHLORIDE SOLUTION AND SODIUM CHLORIDE SOLUTION		17	
Dutch liquid	ETHYLENE DICHLORIDE	17	1184
Dutch oil	ETHYLENE DICHLORIDE	17	1184
(E)-But-2-enal	CROTONALDEHYDE	17	1143
Enanthic acid	N-HEPTANOIC ACID	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Enanthyl alcohol	HEPTANOL (ALL ISOMERS) (D)	17	
Enanthylic acid	N-HEPTANOIC ACID	17	
Engravers' acid	NITRIC ACID (70% AND OVER)	17	2031, 2032
E-1,3-Pentadiene	1,3-PENTADIENE	17	
EPICHLOROHYDRIN		17	2023
1,2-Epoxybutane	1,2-BUTYLENE OXIDE	17	3022
1,4-epoxybutane	TETRAHYDROFURAN	17	2056
1,2-Epoxypropane	PROPYLENE OXIDE	17	1280
2,3-Epoxy propyl ester of mixed trialkyl acetic acids	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17	
2,3-Epoxypropyl neodecanoate	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17	
alpha-2,3-Epoxypropyl-omega-{alpha-[4-(2,3-epoxypropyl)phenyl]-alpha,alpha-dimethyl-p-tolyloxy}poly[oxy-p-phenyleneisopropylidene-p-phenyleneoxy(2-hydroxytrimethylene)]	DIGLYCIDYL ETHER OF BISPHENOL A	17	
alpha-2,3-Epoxypropyl-omega-{alpha-[4-(2,3-epoxypropoxy)phenyl]-p-tolyloxy}poly[oxy-p-phenylenemethylene-p-phenyleneoxy(2-hydroxytrimethylene)]	DIGLYCIDYL ETHER OF BISPHENOL F	17	
EPTC	S-ETHYL DIPROPYLTHIOCARBAMATE	17	
Essence of Mirbane	NITROBENZENE	17	1662
Essence of Myrbane	NITROBENZENE	17	1662
Ethanamine solutions, 72% or less	ETHYLAMINE SOLUTIONS (72% OR LESS)	17	2270
Ethancarbonitrile	PROPIONITRILE	17	2404
Ethanedial	GLYOXAL SOLUTION (40% OR LESS)	17	
1,2-Ethanedial	ETHYLENE GLYCOL	17	
Ethanoic acid	ACETIC ACID	17	
Ethanoic anhydride	ACETIC ANHYDRIDE	17	1715
Ethanol	ETHYL ALCOHOL	18	
ETHANOLAMINE		17	2491
ethenyl acetate	VINYL ACETATE	17	1301
ethenyl ethanoate	VINYL ACETATE	17	1301
Ether	DIETHYL ETHER	17	1155
Ethynyl trichloride	TRICHLOROETHYLENE	17	1710
2-Ethoxyethanol	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
2-(2-Ethoxyethoxy)ethanol	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
2-(2-Ethoxyethoxy)ethyl acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
2-ETHOXYETHYL ACETATE		17	1172
ETHOXYLATED LONG CHAIN (C16+) ALKYLOXYALKYLAMINE		17	
2-Ethoxy-2-methylpropane	ETHYL TERT-BUTYL ETHER	17	1993
1-Ethoxypropan-2-ol	PROPYLENE GLYCOL MONOALKYL ETHER	17	
ETHYL ACETATE		17	
ETHYL ACETOACETATE		17	
Ethyl acetone	METHYL PROPYL KETONE	18	1249
ETHYL ACRYLATE		17	1917
ETHYL ALCOHOL		18	
ETHYLAMINE		17	1036
ETHYLAMINE SOLUTIONS (72% OR LESS)		17	2270
Ethylaminocyclohexane	N-ETHYLCYCLOHEXYLAMINE	17	
ETHYL AMYL KETONE		17	2271
ETHYLBENZENE		17	1175
Ethyl benzol	ETHYLBENZENE	17	1175
Ethyl butanoate	ETHYL BUTYRATE	17	1180
ETHYL TERT-BUTYL ETHER		17	1993
ETHYL BUTYRATE		17	1180
2-Ethylcaproic acid	2-ETHYLHEXANOIC ACID	17	
Ethyl carbinol	N-PROPYL ALCOHOL	17	1274

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Ethyl cyanide	PROPIONITRILE	17	2404
ETHYLCYCLOHEXANE		17	
Ethyl(cyclohexyl)amine	N-ETHYLCYCLOHEXYLAMINE	17	
N-ETHYLCYCLOHEXYLAMINE		17	
Ethyldimethylmethane	PENTANE (ALL ISOMERS)	17	1265
S-Ethyl dipropylcarbamothioate	S-ETHYL DIPROPYLTHIOCARBAMATE	17	
S-Ethyl dipropyldithiocarbamate	S-ETHYL DIPROPYLTHIOCARBAMATE	17	
S-ETHYL DIPROPYLTHIOCARBAMATE		17	
Ethylene alcohol	ETHYLENE GLYCOL	17	
Ethylene bisiminodiacetic acid tetrasodium salt solution	ETHYLENEDIAMINETETRAACETIC ACID, TETRASODIUM SALT SOLUTION	17	
Ethylene bromide	ETHYLENE DIBROMIDE	17	1605
ETHYLENE CARBONATE		18	
Ethylenecarboxylic acid	ACRYLIC ACID	17	2218
Ethylene chloride	ETHYLENE DICHLORIDE	17	1184
ETHYLENE CHLOROHYDRIN		17	1135
ETHYLENE CYANOHYDRIN		17	
Ethylene diacetate	ETHYLENE GLYCOL DIACETATE	17	
ETHYLENEDIAMINE		17	1604
ETHYLENEDIAMINETETRAACETIC ACID, TETRASODIUM SALT SOLUTION		17	
ETHYLENE DIBROMIDE		17	1605
ETHYLENE DICHLORIDE		17	1184
2,2'-Ethylenedi-iminodi(ethylamine)	TRIETHYLENETETRAMINE	17	2259
Ethylenedinitrilotetraacetic acid tetrasodium salt solution	ETHYLENEDIAMINETETRAACETIC ACID, TETRASODIUM SALT SOLUTION	17	
2,2'-Ethylenedioxydiethanol	TRIETHYLENE GLYCOL	18	
ETHYLENE GLYCOL		17	
ETHYLENE GLYCOL ACETATE		17	
Ethylene glycol acrylate	2-HYDROXYETHYL ACRYLATE	17	
Ethylene glycol butyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
ETHYLENE GLYCOL BUTYL ETHER ACETATE		17	
Ethylene glycol tert-butyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
ETHYLENE GLYCOL DIACETATE		17	
Ethylene glycol ethyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Ethylene glycol ethyl ether acetate	2-ETHOXYETHYL ACETATE	17	1172
Ethylene glycol isopropyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Ethylene glycol methyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
ETHYLENE GLYCOL METHYL ETHER ACETATE		17	
ETHYLENE GLYCOL MONOALKYL ETHERS		17	
Ethylene glycol monobutyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Ethylene glycol mono tert-butyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Ethylene glycol monoethyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Ethylene glycol monoethyl ether acetate	2-ETHOXYETHYL ACETATE	17	1172
Ethylene glycol monomethyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Ethylene glycol monomethyl ether acetate	ETHYLENE GLYCOL METHYL ETHER ACETATE	17	
Ethylene glycol monophenyl ether	ETHYLENE GLYCOL PHENYL ETHER	17	
ETHYLENE GLYCOL PHENYL ETHER		17	
ETHYLENE GLYCOL PHENYL ETHER/DIETHYLENE GLYCOL PHENYL ETHER MIXTURE		17	
ETHYLENE OXIDE/PROPYLENE OXIDE MIXTURE WITH AN ETHYLENE OXIDE CONTENT OF NOT MORE THAN 30% BY MASS		17	2983
Ethylene tetrachloride	PERCHLOROETHYLENE	17	1897
Ethylene trichloride	TRICHLOROETHYLENE	17	1710
ETHYLENE-VINYL ACETATE COPOLYMER (EMULSION)		17	
Ethyl ethanoate	ETHYL ACETATE	17	
Ethyl ether	DIETHYL ETHER	17	1155
ETHYL-3-ETHOXYPROPIONATE		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Ethyl fluid	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
Ethylformic acid	PROPIONIC ACID	17	1848
Ethyl glycol	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
2-Ethylhexaldehyde	OCTYL ALDEHYDES	17	1191
2-Ethylhexanal	OCTYL ALDEHYDES	17	1191
2-ETHYLHEXANOIC ACID		17	
2-Ethylhexanol	OCTANOL (ALL ISOMERS)	17	
2-Ethylhexenal	2-ETHYL-3-PROPYLACROLEIN	17	
2-Ethylhex-2-enal	2-ETHYL-3-PROPYLACROLEIN	17	
2-Ethylhexoic acid	OCTANOIC ACID (ALL ISOMERS)	17	
2-ETHYLHEXYL ACRYLATE		17	
2-Ethylhexyl alcohol	OCTANOL (ALL ISOMERS)	17	
2-ETHYLHEXYLAMINE		17	2276
2-ETHYL-2-(HYDROXYMETHYL)PROPANE-1,3-DIOL, C8-C10 ESTER		17	
Ethyllic acid	ACETIC ACID	17	
5-Ethylidenebicyclo(2.2.1)hept-2-ene	ETHYLIDENE NORBORNENE	17	
Ethylidene chloride	1,1-DICHLOROETHANE	17	2362
Ethylidene dichloride	1,1-DICHLOROETHANE	17	2362
ETHYLIDENE NORBORNENE		17	
ETHYL METHACRYLATE		17	2277
N-ETHYLMETHYLALLYLAMINE		17	
N-Ethyl-2-methylallylamine	N-ETHYLMETHYLALLYLAMINE	17	
2-Ethyl-6-methylbenzenamine	2-METHYL-6-ETHYL ANILINE	17	
Ethyl methyl ketone	METHYL ETHYL KETONE	17	
5-Ethyl-2-methylpyridine	2-METHYL-5-ETHYL PYRIDINE	17	2300
Ethyl oxide	DIETHYL ETHER	17	1155
Ethyl phosphate	TRIETHYL PHOSPHATE	17	
Ethyl phthalate	DIETHYL PHTHALATE	17	
5-Ethyl-2-picoline	2-METHYL-5-ETHYL PYRIDINE	17	2300
3-Ethylpropan-1-ol	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Ethyl propenoate	ETHYL ACRYLATE	17	1917
ETHYL PROPIONATE		17	
2-ETHYL-3-PROPYLACROLEIN		17	
Ethyl sulphate	DIETHYL SULPHATE	17	1594
ETHYL TOLUENE		17	
5-Ethyl-o-toluidine	2-METHYL-5-ETHYL PYRIDINE	17	2300
6-Ethyl-2-toluidine	2-METHYL-6-ETHYL ANILINE	17	
6-Ethyl-o-toluidine	2-METHYL-6-ETHYL ANILINE	17	
Ethyl vinyl ether	VINYL ETHYL ETHER	17	1302
Ethynyldimethylcarbinol	2-METHYL-2-HYDROXY-3-BUTYNE	17	
FATTY ACID (SATURATED C13+)		17	
FATTY ACID METHYL ESTERS (M)		17	
FATTY ACIDS, (C16+)		17	
FATTY ACIDS, 12+		17	
FATTY ACID, C8-C10		17	
FATTY ACIDS, ESSENTIALLY LINEAR (C6-C18) 2-ETHYLHEXYL ESTER		17	
Feeding corn molasses	MOLASSES	18	
Fermentation alcohol	ETHYL ALCOHOL	18	
FERRIC CHLORIDE SOLUTIONS		17	2582
FERRIC NITRATE/NITRIC ACID SOLUTION		17	
FISH OIL		17	
FLUOROSILICIC ACID (20-30%) IN WATER SOLUTION		17	1778
FORMALDEHYDE SOLUTIONS (45% OR LESS)		17	1198, 2209
Formaldehyde trimer	1,3,5-TRIOXANE	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Formalin	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17	1198, 2209
FORMAMIDE		17	
Formdimethylamide	DIMETHYLFORMAMIDE	17	2265
FORMIC ACID		17	1779
Formic aldehyde	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17	1198, 2209
Formylformic acid	GLYOXYLIC ACID SOLUTION (50% OR LESS)	17	1760
Fural	FURFURAL	17	1199
2-Furaldehyde	FURFURAL	17	1199
2,5-Furandione	MALEIC ANHYDRIDE	17	2215
Furan-2,5-dione	MALEIC ANHYDRIDE	17	2215
FURFURAL		17	1199
2-Furfuraldehyde	FURFURAL	17	1199
FURFURYL ALCOHOL		17	2874
Furylcarbinol	FURFURYL ALCOHOL	17	2874
Fused poly(2+)cyclic aromatic hydrocarbons.	POLY(2+)CYCLIC AROMATICS	17	
Gaultheria oil	METHYL SALICYLATE	17	
Glacial acetic acid	ACETIC ACID	17	
D-Glucitol	SORBITOL SOLUTION	18	
GLUCITOL/GLYCEROL BLEND PROPOXYLATED (CONTAINING LESS THAN 10% AMINES)		17	
Glucitol solution	SORBITOL SOLUTION	18	
D-Glucopyranoside C8-C14 alkyl	ALKYL (C8-C10)/(C12-C14):(40% OR LESS/60% OR MORE) POLYGLUCOSIDE SOLUTION (55% OR LESS)	17	
D-Glucopyranoside C8-C14 alkyl	ALKYL (C8-C10)/(C12-C14):(60% OR MORE/40% OR LESS) POLYGLUCOSIDE SOLUTION(55% OR LESS)	17	
GLUCOSE SOLUTION		18	
GLUTARALDEHYDE SOLUTIONS (50% OR LESS)		17	
Glycerin	GLYCERINE	18	
GLYCERINE		18	
Glycerin triacetate	GLYCERYL TRIACETATE	17	
Glyceritol	GLYCERINE	18	
Glycerol	GLYCERINE	18	
GLYCEROL MONOOLEATE		18	
Glycerol oleate	GLYCEROL MONOOLEATE	18	
Glycerol 1-oleate	GLYCEROL MONOOLEATE	17	
GLYCEROL PROPOXYLATED		17	
GLYCEROL, PROPOXYLATED AND ETHOXYLATED		17	
GLYCEROL/SUCROSE BLEND PROPOXYLATED AND ETHOXYLATED		17	
Glycerol triacetate	GLYCERYL TRIACETATE	17	
GLYCERYL TRIACETATE		17	
GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID		17	
Glycidyl neodecanoate	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17	
Glycine soda solution	GLYCINE, SODIUM SALT SOLUTION	17	
GLYCINE, SODIUM SALT SOLUTION		17	
Glycol	ETHYLENE GLYCOL	17	
Glycol carbonate	ETHYLENE CARBONATE	18	
Glycol chlorohydrin	ETHYLENE CHLOROHYDRIN	17	1135
Glycol dichloride	ETHYLENE DICHLORIDE	17	1184
GLYCOLIC ACID SOLUTION (70% OR LESS)		17	3265
Glycol monobutyl ether	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Glycols, polyethylene mono(p-nonylphenyl) ether	ALKARYL POLYETHERS (C9-C20)	17	
Glycyl alcohol	GLYCERINE	18	
Glyoxaldehyde	GLYOXAL SOLUTION (40% OR LESS)	17	
Glyoxalic acid	GLYOXYLIC ACID SOLUTION (50% OR LESS)	17	1760

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
GLYOXAL SOLUTION (40% OR LESS)		17	
GLYOXYLIC ACID SOLUTION (50% OR LESS)		17	1760
Glyphosate	GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)	17	
Glyphosate-mono(isopropylammonium)	GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)	17	
GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)		17	
Grain alcohol	ETHYL ALCOHOL	18	
GROUNDNUT OIL		17	
Hemimellitine	TRIMETHYLBENZENE (ALL ISOMERS)	17	
Henecanoic acid	UNDECANOIC ACID	17	
1-Henecanol	UNDECYL ALCOHOL	17	
Heptamethylene	CYCLOHEPTANE	17	2241
HEPTANE (ALL ISOMERS)		17	1206
1-Heptanecarboxylic acid	OCTANOIC ACID (ALL ISOMERS)	17	
3-Heptanecarboxylic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Heptanoic acid	N-HEPTANOIC ACID	17	
N-HEPTANOIC ACID		17	
HEPTANOL (ALL ISOMERS) (D)		17	
2-Heptanone	METHYL AMYL KETONE	17	1110
Heptan-2-one	METHYL AMYL KETONE	17	1110
Heptan-2-one	METHYL AMYL KETONE	17	1110
HEPTENE (ALL ISOMERS)		17	
Heptoic acid	N-HEPTANOIC ACID	17	
HEPTYL ACETATE		17	
Heptyl alcohol, all isomers	HEPTANOL (ALL ISOMERS) (D)	17	
Heptylcarbinol	OCTANOL (ALL ISOMERS)	17	
Heptylene, mixed isomers	HEPTENE (ALL ISOMERS)	17	
Heptylic acid	N-HEPTANOIC ACID	17	
n-Heptylic acid	N-HEPTANOIC ACID	17	
1-Hexadecene	OLEFINS (C13+, ALL ISOMERS)	17	
Hexadecyl and icosyl methacrylate mixture	CETYL/EICOSYL METHACRYLATE MIXTURE	17	
1-HEXADECYLNAPHTHALENE / 1,4-BIS(HEXADECYL)NAPHTHALENE MIXTURE		17	
Hexadecylnaphthalene/dihexadecylnaphthalene mixture	1-HEXADECYLNAPHTHALENE / 1,4-BIS(HEXADECYL)NAPHTHALENE MIXTURE	17	
Hexadecyl / octadecyl alcohol	ALCOHOLS (C13+)	17	
Hexadecyl, octadecyl and icosyldecyl methacrylates, mixtures	CETYL/EICOSYL METHACRYLATE MIXTURE	17	
Hexadecyl, octadecyl and icosyl methacrylates, mixtures	CETYL/EICOSYL METHACRYLATE MIXTURE	17	
Hexaethylene glycol	POLYETHYLENE GLYCOL	17	
Hexahydroaniline	CYCLOHEXYLAMINE	17	2357
Hexahydro-1H-azepine	HEXAMETHYLENEIMINE	17	2493
Hexahydrobenzene	CYCLOHEXANE	17	1145
Hexahydro-1-H-azepine	HEXAMETHYLENEIMINE	17	2493
Hexahydrophenol	CYCLOHEXANOL	17	
Hexahydrotoluene	METHYLCYCLOHEXANE	17	2296
Hexamethylene	CYCLOHEXANE	17	1145
HEXAMETHYLENEDIAMINE (MOLTEN)		17	
HEXAMETHYLENEDIAMINE ADIPATE (50% IN WATER)		17	
HEXAMETHYLENEDIAMINE SOLUTION		17	1783
1,6-Hexamethylenediamine solution	HEXAMETHYLENEDIAMINE SOLUTION	17	1783
Hexamethylenediammonium adipate solution (50% solution)	HEXAMETHYLENEDIAMINE ADIPATE (50% IN WATER)	17	
HEXAMETHYLENE DIISOCYANATE		17	2281
Hexamethylene-1,6-diisocyanate	HEXAMETHYLENE DIISOCYANATE	17	2281
HEXAMETHYLENE GLYCOL		17	
HEXAMETHYLENEIMINE		17	2493
HEXAMETHYLENETETRAMINE SOLUTIONS		18	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Hexamine	HEXAMETHYLENETETRAMINE SOLUTIONS	18	
Hexanaphthene	CYCLOHEXANE	17	1145
1,6-Hexandiamine hexanedioate (1:1)	HEXAMETHYLENEDIAMINE ADIPATE (50% IN WATER)	17	
HEXANE (ALL ISOMERS)		17	1208
1,6-Hexanediamine	HEXAMETHYLENEDIAMINE (MOLTEN)	17	
1,6-Hexanediamine solutions	HEXAMETHYLENEDIAMINE SOLUTION	17	1783
Hexane-1,6-diamine solutions	HEXAMETHYLENEDIAMINE SOLUTION	17	1783
Hexanedioic acid, bis(2-ethylhexyl) ester	DI-(2-ETHYLHEXYL) ADIPATE	17	
1,6-Hexanediol	HEXAMETHYLENE GLYCOL	17	
1,6-Hexanediol	HEXAMETHYLENE GLYCOL	17	
Hexane-1,6-diol	HEXAMETHYLENE GLYCOL	17	
1,6-HEXANEDIOL, DISTILLATION OVERHEADS		17	1987
n-Hexane	HEXANE (ALL ISOMERS)	17	1208
HEXANOIC ACID		17	
HEXANOL		17	2282
Hexan-1-ol	HEXANOL	17	2282
Hexan-6-olide	EPSILON-CAPROLACTAM (MOLTEN OR AQUEOUS SOLUTIONS)	17	
2-Hexanone	METHYL BUTYL KETONE	17	1124
Hexan-2-one	METHYL BUTYL KETONE	17	1224
HEXENE (ALL ISOMERS)		17	2370
Hexene-1	HEXENE (ALL ISOMERS)	17	2370
Hex-1-ene	HEXENE (ALL ISOMERS)	17	2370
2-Hexene	HEXENE (ALL ISOMERS)	17	2370
Hexone	METHYL ISOBUTYL KETONE	17	
HEXYL ACETATE		17	1233
sec-Hexyl acetate	METHYLAMYL ACETATE	17	1233
Hexyl alcohol	HEXANOL	17	2282
Hexyldimethylamine	ALKYL (C12+) DIMETHYLAMINE	17	2735
Hexylene	HEXENE (ALL ISOMERS)	17	2370
HEXYLENE GLYCOL		18	
Hexyl ethanoate	HEXYL ACETATE	17	1233
Homopiperidine	HEXAMETHYLENEIMINE	17	2493
HYDROCHLORIC ACID		17	1789
Hydrofuran	TETRAHYDROFURAN	17	2056
Hydrogenated glucose syrup	MALTITOL SOLUTION	18	
Hydrogenated maltose syrup	MALTITOL SOLUTION	18	
Hydrogenated oligosaccharide	HYDROGENATED STARCH HYDROLYSATE	18	
HYDROGENATED STARCH HYDROLYSATE		18	
Hydrogencarboxylic acid	FORMIC ACID	17	1779
Hydrogen chloride, aqueous	HYDROCHLORIC ACID	17	1789
HYDROGEN PEROXIDE SOLUTIONS (OVER 60% BUT NOT OVER 70% BY MASS)		17	2015
HYDROGEN PEROXIDE SOLUTIONS (OVER 8% BUT NOT OVER 60% BY MASS)		17	2014, 2984
Hydrogen sulphate	SULPHURIC ACID	17	1830
alpha-Hydro-omega-hydroxypoly[oxy(methyl-1,2-ethanediyl)]	POLYPROPYLENE GLYCOL	17	
Hydroxyacetic acid	GLYCOLIC ACID SOLUTION (70% OR LESS)	17	3265
Hydroxybenzene	PHENOL	17	2312
4-Hydroxybutanoic acid lactone	GAMMA-BUTYROLACTONE	17	
4-Hydroxybutyric acid lactone	GAMMA-BUTYROLACTONE	17	
gamma-Hydroxybutyric acid lactone	GAMMA-BUTYROLACTONE	17	
Hydroxydimethylbenzenes	XYLENOL	17	2261
Hydroxyethanoic acid	GLYCOLIC ACID SOLUTION (70% OR LESS)	17	3265
2-HYDROXYETHYL ACETATE	ETHYLENE GLYCOL ACETATE	17	
2-HYDROXYETHYL ACRYLATE		17	
beta-Hydroxyethyl acrylate	2-HYDROXYETHYL ACRYLATE	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
2-Hydroxyethylamine	ETHANOLAMINE	17	2491
N-beta-Hydroxyethylethylenediamine	AMINOETHYL ETHANOLAMINE	17	
N-(HYDROXYETHYL) ETHYLENEDIAMINETRIACETIC ACID, TRISODIUM SALT SOLUTION		17	
beta-Hydroxyethyl phenyl ether	ETHYLENE GLYCOL PHENYL ETHER	17	
2-Hydroxyethyl propenoate	2-HYDROXYETHYL ACRYLATE	17	
2-Hydroxyethyl 2-propenoate	2-HYDROXYETHYL ACRYLATE	17	
alpha-Hydroxyisobutyronitrile	ACETONE CYANOHYDRIN	17	1541
4-Hydroxy-2-keto-4-methylpentane	DIACETONE ALCOHOL	17	
4-Hydroxy-4-methylpentanone-2	DIACETONE ALCOHOL	17	
4-Hydroxy-4-methylpentan-2-one	DIACETONE ALCOHOL	17	
2-(Hydroxymethyl)propane	ISOBUTYL ALCOHOL	17	1212
2-Hydroxy-2-methylpropionitrile	ACETONE CYANOHYDRIN	17	1541
2-HYDROXY-4-(METHYLTHIO)BUTANOIC ACID		17	
2-Hydroxy-4-methylthiobutyric acid	2-HYDROXY-4-(METHYLTHIO)BUTANOIC ACID	17	
2-Hydroxynitrobenzene (molten)	O-NITROPHENOL (MOLTEN)	17	1663
1-Hydroxy-2-phenoxyethane	ETHYLENE GLYCOL PHENYL ETHER	17	
2-Hydroxypropanoic acid	LACTIC ACID	17	
2-Hydroxypropionic acid	LACTIC ACID	17	
alpha-Hydroxypropionic acid	LACTIC ACID	17	
3-Hydroxypropionic acid, lactone.	BETA-PROPIOLACTONE	17	
2-Hydroxypropionitrile	LACTONITRILE SOLUTION (80% OR LESS)	17	
alpha-Hydroxypropionitrile	LACTONITRILE SOLUTION (80% OR LESS)	17	
beta-Hydroxypropionitrile	ETHYLENE CYANOHYDRIN	17	
2-Hydroxypropionitrile	LACTONITRILE SOLUTION (80% OR LESS)	17	
3-Hydroxypropionitrile	ETHYLENE CYANOHYDRIN	17	
2-[2-(2-hydroxypropoxy)propoxy]propan-1-ol	TRIPROPYLENE GLYCOL	17	
2-Hydroxypropylamine	ISOPROPANOLAMINE	17	
3-Hydroxypropylamine	N-PROPANOLAMINE	17	
alpha-Hydroxytoluene	BENZYL ALCOHOL	17	
3-Hydroxy-2,2,4-trimethylpentylisobutyrate	2,2,4-TRIMETHYL-1,3-PENTANEDIOL-1-ISOBUTYRATE	17	
ILLIPE OIL		17	
2,2'-[Iminobis(ethyleneimino)]diethylamine	TETRAETHYLENE PENTAMINE	17	2320
2,2'-Iminodi(ethylamine)	DIETHYLENETRIAMINE	17	2079
2,2'-Iminodiethanol	DIETHANOLAMINE	17	
1,1'-Iminodipropan-2-ol	DIISOPROPANOLAMINE	17	
Iron (III) chloride solutions	FERRIC CHLORIDE SOLUTIONS	17	2582
Iron (III) nitrate / nitric acid solution	FERRIC NITRATE/NITRIC ACID SOLUTION	17	
Isoacetophenone	ISOPHORONE	17	
Isoamyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
ISOAMYL ALCOHOL		17	
Isobutaldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
Isobutanal	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
Isobutanol	ISOBUTYL ALCOHOL	17	1212
Isobutanolamine	2-AMINO-2-METHYL-1-PROPANOL	17	
Isobutyl acetate	BUTYL ACETATE (ALL ISOMERS)	17	1123
Isobutyl acrylate	BUTYL ACRYLATE (ALL ISOMERS)	17	2348
ISOBUTYL ALCOHOL		17	1212
Isobutyl aldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
Isobutylamine	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
Isobutylcarbinol	ISOAMYL ALCOHOL	17	
ISOBUTYL FORMATE		17	2393
Isobutyl ketone	DIISOBUTYL KETONE	17	
ISOBUTYL METHACRYLATE		17	
Isobutylmethylcarbinol	METHYLAMYL ALCOHOL	17	2053
Isobutyl methyl ketone	METHYL ISOBUTYL KETONE	17	
Isobutylmethylmethanol	METHYLAMYL ALCOHOL	17	2053

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Isobutyraldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
Isobutyric aldehyde	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
Alpha-Isocyanatobenzyl-omega-isocyanatophenyl[(phenylisocyanate)-alt-formaldehyde]	POLYMETHYLENE POLYPHENYL ISOCYANATE	17	2206(i) 2207
1-Isocyanato-3-isocyanatomethyl-trimethylcyclohexane	ISOPHORONE DIISOCYANATE	17	2290
3-Isocyanatomethyl-3,5,5-trimethylcyclohexyl isocyanate	ISOPHORONE DIISOCYANATE	17	2290
Isodecanol	DECYL ALCOHOL (ALL ISOMERS)	17	
Isodecyl alcohol	DECYL ALCOHOL (ALL ISOMERS)	17	
Isododecane	DODECANE (ALL ISOMERS)	17	
Isodurene	TETRAMETHYLBENZENE (ALL ISOMERS)	17	
Isononanoic acid	NONANOIC ACID (ALL ISOMERS)	17	
Isononanol	NONYL ALCOHOL (ALL ISOMERS)	17	
Isooctane	OCTANE (ALL ISOMERS)	17	1262
Isooctanol	OCTANOL (ALL ISOMERS)	17	
Isopentane	PENTANE (ALL ISOMERS)	17	1265
Isopentanol	AMYL ALCOHOL, PRIMARY	17	
Isopentanol	ISOAMYL ALCOHOL	17	
Isopentene	PENTENE (ALL ISOMERS)	17	
Isopentyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
Isopentyl alcohol	ISOAMYL ALCOHOL	17	
ISOPHORONE		17	
ISOPHORONEDIAMINE		17	2289
ISOPHORONE DIISOCYANATE		17	2290
ISOPRENE		17	1218
Isopropanol	ISOPROPYL ALCOHOL	18	
ISOPROPANOLAMINE		17	
Isopropenylbenzene	ALPHA-METHYLSTYRENE	17	2303
2-Isopropoxyethanol	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
2-Isopropoxypropane	ISOPROPYL ETHER	17	1159
ISOPROPYL ACETATE		17	1220
Isopropylacetone	METHYL ISOBUTYL KETONE	17	
ISOPROPYL ALCOHOL		18	
ISOPROPYLAMINE		17	1221
ISOPROPYLAMINE (70% OR LESS) SOLUTION		17	
Isopropylammonium N-(phosphonomethyl)glycine	GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)	17	
Isopropylcarbinol	ISOBUTYL ALCOHOL	17	1212
Isopropyl carbinol	ISOBUTYL ALCOHOL	17	1212
ISOPROPYLCYCLOHEXANE		17	
1-Isopropyl-3,3-dimethyltrimethylene diisocyanate	2,2,4-TRIMETHYL-1,3-PENTANEDIOL DIISOBUTYRATE	17	
ISOPROPYL ETHER		17	1159
Isopropylideneacetone	MESITYL OXIDE	17	1229
Isopropyl oxide	ISOPROPYL ETHER	17	1159
Isopropyltoluene	P-CYMENE	17	2046
4-Isopropyltoluene	P-CYMENE	17	2046
4-Isopropyltoluol	P-CYMENE	17	2046
Isovaleral	VALERALDEHYDE (ALL ISOMERS)	17	2058
Isovaleraldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
Isovaleraldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
Isovaleric aldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
Isovalerone	DIISOBUTYL KETONE	17	
Kaolin clay slurry	KAOLIN SLURRY	18	
Kaolinite slurry	KAOLIN SLURRY	18	
KAOLIN SLURRY		18	
Ketohexamethylene	CYCLOHEXANONE	17	1915
Ketone propane	ACETONE	18	
Ketopropane	ACETONE	18	
LACTIC ACID		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
LACTONITRILE SOLUTION (80% OR LESS)		17	
LARD		17	
LATEX, AMMONIA (1% OR LESS) INHIBITED		17	
LATEX: CARBOXYLATED STYRENE-BUTADIENE COPOLYMER; STYRENE-BUTADIENE RUBBER		17	
LAURIC ACID		17	
Lauryl alcohol	DODECYL ALCOHOL	17	
Lauryl mercaptan	TERT-DODECANETHIOL	17	
Lauryl methacrylate	DODECYL METHACRYLATE	17	
Lead alkyls, n.o.s.	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
Lead tetraethyl	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
Lead tetramethyl	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
LECITHIN		18	
LIGNINSULPHONIC ACID, SODIUM SALT SOLUTION		17	3806
Limonene	DIPENTENE	17	2052
Linear alkylbenzene (LAB) bottoms	ALKYL BENZENE DISTILLATION BOTTOMS	17	
LINSEED OIL		17	
LIQUID CHEMICAL WASTES		17	
LONG-CHAIN ALKARYL POLYETHER (C11-C20)		17	
LONG-CHAIN ALKARYL SULPHONIC ACID (C16-C60)		17	
LONG-CHAIN ALKYLPHENATE/PHENOL SULPHIDE MIXTURE		17	
Lye	SODIUM HYDROXIDE SOLUTION	17	1824
Lye, potash	POTASSIUM HYDROXIDE SOLUTION	17	1814
Lye, soda	SODIUM HYDROXIDE SOLUTION	17	1824
Lye solution	SODIUM HYDROXIDE SOLUTION	17	1824
L-LYSINE SOLUTION (60% OR LESS)		17	
Magnesia hydrate	MAGNESIUM HYDROXIDE SLURRY	18	
MAGNESIUM CHLORIDE SOLUTION		17	
MAGNESIUM HYDROXIDE SLURRY		18	
MAGNESIUM LONG-CHAIN ALKARYL SULPHONATE (C11-C50)		17	
MAGNESIUM LONG-CHAIN ALKYL SALICYLATE (C11+)		17	
MALEIC ANHYDRIDE		17	2215
Maltitol	MALTITOL SOLUTION	18	
MALTITOL SOLUTION		18	
Maltitol syrup	MALTITOL SOLUTION	18	
MANGO KERNEL OIL		17	
Meglumine	N-METHYLGLUCAMINE SOLUTION (70% OR LESS)	18	
MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION		17	
Mesitylene	TRIMETHYLBENZENE (ALL ISOMERS)	17	
MESITYL OXIDE		17	1229
Metaformaldehyde	1,3,5-TRIOXANE	17	
Metam-sodium	METAM SODIUM SOLUTION	17	
METAM SODIUM SOLUTION		17	
METHACRYLIC ACID		17	2531
METHACRYLIC ACID - ALKOXPOLY (ALKYLENE OXIDE) METHACRYLATE COPOLYMER, SODIUM SALT AQUEOUS SOLUTION (45% OR LESS)		17	
alpha-Methacrylic acid	METHACRYLIC ACID	17	2531
Methacrylic acid, dodecyl ester	DODECYL METHACRYLATE	17	
Methacrylic acid, lauryl ester	DODECYL METHACRYLATE	17	
METHACRYLIC RESIN IN ETHYLENE DICHLORIDE		17	
METHACRYLONITRILE		17	3079
Methanal	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17	1198, 2209
Methanamide	FORMAMIDE	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Methanamine	METHYLAMINE SOLUTIONS (42% OR LESS)	17	1235
Methane carboxylic acid	ACETIC ACID	17	
Methanecarboxylic acid	ACETIC ACID	17	
Methanoic acid	FORMIC ACID	17	1779
Methanol	METHYL ALCOHOL	17	
Methenamine	HEXAMETHYLENETETRAMINE SOLUTIONS	18	
3-METHOXY-1-BUTANOL		17	
3-Methoxybutan-1-ol	3-METHOXY-1-BUTANOL	17	
3-METHOXYBUTYL ACETATE		17	
2-Methoxyethanol	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
2-(2-Methoxyethoxy)ethanol	POLY(2-8)ALKYLENE GLYCOL		
	MONOALKYL(C1-C6) ETHER	17	
2-[2-(2-Methoxyethoxy)ethoxy]ethanol	POLY(2-8)ALKYLENE GLYCOL		
	MONOALKYL(C1-C6) ETHER	17	
2-(2-Methoxyethoxy)ethyl acetate	POLY(2-8)ALKYLENE GLYCOL		
	MONOALKYL(C1-C6) ETHER ACETATE	17	
2-Methoxyethyl acetone	ETHYLENE GLYCOL METHYL ETHER ACETATE	17	
2-Methoxy-2-methyl butane	TERT-AMYL METHYL ETHER	17	1993
3-Methoxy-3-methylbutan-1-ol	3-METHYL-3-METHOXYBUTANOL	17	
3-Methoxy-3-methylbutyl alcohol	3-METHYL-3-METHOXYBUTANOL	17	
2-Methoxy-1-methylethyl acetate	PROPYLENE GLYCOL METHYL ETHER ACETATE	17	
N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL-6-METHYL CHLOROACETANILIDE		17	
2-methoxy-2-methylpropane	METHYL TERT-BUTYL ETHER	17	
1-Methoxypropan-2-ol	PROPYLENE GLYCOL MONOALKYL ETHER	17	
1-Methoxy-2-propanol acetate	PROPYLENE GLYCOL METHYL ETHER ACETATE	17	
1-(2-Methoxypropoxy)propan-2-ol	POLY(2-8)ALKYLENE GLYCOL		
	MONOALKYL(C1-C6) ETHER	17	
3-[3-(3-Methoxypropoxy)propoxy]propan-1-ol	POLY(2-8)ALKYLENE GLYCOL		
	MONOALKYL(C1-C6) ETHER	17	
Methoxytriglycol	POLY(2-8)ALKYLENE GLYCOL		
	MONOALKYL(C1-C6) ETHER	17	
Methylacetaldehyde	PROPIONALDEHYDE	17	1275
METHYL ACETATE		17	
Methylacetic acid	PROPIONIC ACID	17	1848
METHYL ACETOACETATE		17	
Methyl acetylacetate	METHYL ACETOACETATE	17	
beta-Methylacrolein	CROTONALDEHYDE	17	1143
METHYL ACRYLATE		17	1919
2-Methylacrylic acid	METHACRYLIC ACID	17	2531
2-Methylacrylic acid, dodecyl ester	DODECYL METHACRYLATE	17	
2-Methylacrylic acid, lauryl ester	DODECYL METHACRYLATE	17	
METHYL ALCOHOL		17	
METHYLAMINE SOLUTIONS (42% OR LESS)		17	1235
1-Methyl-2-aminobenzene	O-TOLUIDINE	17	1708
2-Methyl-1-aminobenzene	O-TOLUIDINE	17	1708
METHYLAMYL ACETATE		17	1233
METHYLAMYL ALCOHOL		17	2053
METHYL AMYL KETONE		17	1110
Methyl n-amyl ketone	METHYL AMYL KETONE	17	1110
2-Methylaniline	O-TOLUIDINE	17	1708
3-Methylaniline	O-TOLUIDINE	17	1708
o-Methylaniline	O-TOLUIDINE	17	1708
2-Methylbenzenamine	O-TOLUIDINE	17	1708
3-Methylbenzenamine	O-TOLUIDINE	17	1708
o-Methylbenzenamine	O-TOLUIDINE	17	1708
Methylbenzene	TOLUENE	17	1294

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Methylbenzenediamine	TOLUENEDIAMINE	17	1709
Methylbenzol	TOLUENE	17	1294
2-Methyl-1,3-butadiene	ISOPRENE	17	1218
3-Methyl-1,3-butadiene	ISOPRENE	17	1218
2-Methylbutanal	VALERALDEHYDE (ALL ISOMERS)	17	2058
3-Methylbutanal	VALERALDEHYDE (ALL ISOMERS)	17	2058
1-Methylbutane	PENTANE (ALL ISOMERS)	17	1265
2-Methylbutane	PENTANE (ALL ISOMERS)	17	1265
Methyl butanoate	METHYL BUTYRATE	17	1237
2-Methyl-2-butanol	TERT-AMYL ALCOHOL	17	
2-Methylbutan-2-ol	TERT-AMYL ALCOHOL	17	
2-Methyl-4-butanol	ISOAMYL ALCOHOL	17	
3-Methylbutan-1-butanol	ISOAMYL ALCOHOL, PRIMARY	17	
3-Methyl-1-butanol	AMYL ALCOHOL, PRIMARY	17	
3-Methylbutan-1-ol	AMYL ALCOHOL, PRIMARY	17	
3-Methyl-1-butanol	ISOAMYL ALCOHOL	17	
3-Methylbutan-3-ol	TERT-AMYL ALCOHOL	17	
3-Methylbut-1-ene	PENTENE (ALL ISOMERS)	17	
Methylbutenes	PENTENE (ALL ISOMERS)	17	
METHYLBUTENOL		17	
1-Methylbutyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
2-Methyl-2-butyl alcohol	TERT-AMYL ALCOHOL	17	
2-Methyl-4-butyl alcohol	ISOAMYL ALCOHOL	17	
3-Methyl-1-butyl alcohol	ISOAMYL ALCOHOL	17	
3-Methyl-3-butyl alcohol	TERT-AMYL ALCOHOL	17	
METHYL TERT-BUTYL ETHER		17	
METHYL BUTYL KETONE		17	1224
METHYLBUTYNOL		17	
2-Methyl-3-butyn-2-ol	2-METHYL-2-HYDROXY-3-BUTYNE	17	
2-Methylbut-3-yn-2-ol	2-METHYL-2-HYDROXY-3-BUTYNE	17	
2-Methyl-3-butyn-2-ol	METHYLBUTYNOL	17	
2-Methylbut-3-yn-2-ol	METHYLBUTYNOL	17	
2-Methylbutyraldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
3-Methylbutyraldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
METHYL BUTYRATE		17	1237
2-beta-Methyl 'carbitol'	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Methyl 'carbitol' acetate	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER ACETATE	17	
Methyl 'cellosolve'	ETHYLENE GLYCOL MONOALKYL ETHERS	17	
Methyl 'cellosolve' acetate	ETHYLENE GLYCOL METHYL ETHER ACETATE	17	
Methylchloroform	1,1,1-TRICHLOROETHANE	17	2831
Methyl cyanide	ACETONITRILE	17	1648
METHYLCYCLOHEXANE		17	2296
METHYLCYCLOPENTADIENE DIMER		17	
Methyl-1,3-cyclopentadiene dimer	METHYLCYCLOPENTADIENE DIMER	17	
METHYLCYCLOPENTADIENYL MANGANESE TRICARBONYL		17	3281
METHYL DIETHANOLAMINE		17	
4-Methyl-1,3-dioxolan-2-one	PROPYLENE CARBONATE	18	
Methyl disulphide	DIMETHYL DISULPHIDE	17	2381
Methylenebis(4-cyanatobenzene)	DIPHENYLMETHANE DIISOCYANATE	17	2489
Methylenebis(phenyl isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17	2489
Methylenebis(phenylene isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17	2489
Methylenebis(p-phenylene isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17	2489
4,4'-Methylenebis(phenyl isocyanate)	DIPHENYLMETHANE DIISOCYANATE	17	2489
S,S'-Methylenebis[N-dialkyl(C4-C8)dithiocarbamate]	ALKYL DITHIOCARBAMATE (C19-C35)	17	
Methylene bromide	DIBROMOMETHANE	17	
Methylene chloride	DICHLOROMETHANE	17	1593

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Methylene dichloride	DICHLOROMETHANE	17	1593
4,4'-Methylenediphenyl diisocyanate	DIPHENYLMETHANE DIISOCYANATE	17	2489
Methylenedi-p-phenylene diisocyanate	DIPHENYLMETHANE DIISOCYANATE	17	2489
4,4'-Methylenediphenyl isocyanate	DIPHENYLMETHANE DIISOCYANATE	17	2489
2-Methylenepropionic acid	METHACRYLIC ACID	17	2531
Methyl ethanoate	METHYL ACETATE	17	
1-Methylethyl acetate	ISOPROPYL ACETATE	17	1220
1-Methylethylamine	ISOPROPYLAMINE	17	1221
2-METHYL-6-ETHYL ANILINE		17	
1,4-methyl ethyl benzene	ETHYL TOLUENE	17	
Methylethylcarbinol	SEC-BUTYL ALCOHOL	18	
Methyl ethylene glycol	PROPYLENE GLYCOL	18	
Methylethylene glycol	PROPYLENE GLYCOL	18	
Methylethylene oxide	PROPYLENE OXIDE	17	1280
METHYL ETHYL KETONE		17	
N-(1-Methylethyl)propan-2-amine	DIISOPROPYLAMINE	17	1158
2-METHYL-5-ETHYL PYRIDINE		17	2300
METHYL FORMATE		17	1243
N-methyl-D-glucamine	N-METHYLGLUCAMINE SOLUTION (70% OR LESS)	18	
N-METHYLGLUCAMINE SOLUTION (70% OR LESS)		18	
Methyl glycol	PROPYLENE GLYCOL	18	
5-Methylhexan-3-one	METHYL AMYL KETONE	17	2271
5-Methyl-3-heptanone	ETHYL AMYL KETONE	17	2271
5-Methylhexan-2-one	METHYL AMYL KETONE	17	1110
Methylhexylcarbinol	OCTANOL (ALL ISOMERS)	17	
Methyl 2-hydroxybenzoate	METHYL SALICYLATE	17	
Methyl o-hydroxybenzoate	METHYL SALICYLATE	17	
2-Methyl-2-hydroxy-3-butyne	METHYLBUTYNOL	17	
2-METHYL-2-HYDROXY-3-BUTYNE		17	
2,2'-(Methylimino)diethanol	METHYL DIETHANOLAMINE	17	
N-Methyl-2,2'-iminodiethanol	METHYL DIETHANOLAMINE	17	
Methyl isoamyl ketone	METHYL AMYL KETONE	17	1110
Methyl isobutenyl ketone	MESITYL OXIDE	17	1229
Methylisobutylcarbinol	METHYLAMYL ALCOHOL	17	2053
Methylisobutylcarbinol acetate	METHYLAMYL ACETATE	17	1233
METHYL ISOBUTYL KETONE		17	
2-Methylactonitrile	ACETONE CYANOHYDRIN	17	1541
methyl mercaptopropionaldehyde	3-(METHYLTHIO)PROPIONALDEHYDE	17	
METHYL METHACRYLATE		17	1247
Methyl methanoate	METHYL FORMATE	17	1243
3-METHYL-3-METHOXYBUTANOL		17	
Methyl alpha-methylacrylate	METHYL METHACRYLATE	17	1247
7-Methyl-3-methylene-1,6-octadiene	MYRCENE	17	
Methyl 2-methylprop-2-enoate	METHYL METHACRYLATE	17	1247
METHYL NAPHTHALENE (MOLTEN)		17	
alpha-Methylnaphthalene	METHYL NAPHTHALENE (MOLTEN)	17	
beta-Methylnaphthalene	METHYL NAPHTHALENE (MOLTEN)	17	
(o- and p-) Methylnitrobenzene	O- OR P-NITROTOLUENES	17	1664
8-Methylnonan-1-ol	DECYL ALCOHOL (ALL ISOMERS)	17	
Methylolpropane	N-BUTYL ALCOHOL	18	
alpha-Methyl-omega-methoxypoly(ethylene oxide)	POLYETHYLENE GLYCOL DIMETHYL ETHER	17	
alpha-Methyl-omega-methoxypoly(oxy-1,2-ethanediyl)	POLYETHYLENE GLYCOL DIMETHYL ETHER	17	
alpha-Methyl-omega-methoxypoly(oxyethylene)	POLYETHYLENE GLYCOL DIMETHYL ETHER	17	
Methyloxirane	PROPYLENE OXIDE	17	1280
2-Methyl-2,4-pentanediol	HEXYLENE GLYCOL	18	
2-Methylpentane-2,4-diol	HEXYLENE GLYCOL	18	
Methylpentan-2-ol	METHYLAMYL ALCOHOL	17	2053

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
4-Methylpentanol-2	METHYLAMYL ALCOHOL	17	2053
4-Methylpentan-2-ol	METHYLAMYL ALCOHOL	17	2053
4-Methyl-2-pentanol acetate	METHYLAMYL ACETATE	17	1233
4-Methylpentan-2-one	METHYL ISOBUTYL KETONE	17	
4-Methyl-2-pentanone	METHYL ISOBUTYL KETONE	17	
2-Methylpentene	HEXENE (ALL ISOMERS)	17	2370
2-Methyl-1-pentene	HEXENE (ALL ISOMERS)	17	2370
2-Methylpent-1-ene	HEXENE (ALL ISOMERS)	17	2370
4-Methyl-1-pentene	HEXENE (ALL ISOMERS)	17	2370
4-Methyl-3-penten-2-one	MESITYL OXIDE	17	1229
4-Methylpent-3-en-2-one	MESITYL OXIDE	17	1229
4-Methyl-2-pentyl acetate	METHYLAMYL ACETATE	17	1233
Methylpentyl acetates	METHYLAMYL ACETATE	17	1233
Methyl tert-pentyl ether	TERT-AMYL METHYL ETHER	17	1993
Methyl pentyl ketone	METHYL AMYL KETONE	17	1110
Methylphenylenediamine	TOLUENEDIAMINE	17	1709
2-Methyl-m-phenylenediamine	TOLUENEDIAMINE	17	1709
4-Methyl-m-phenylenediamine	TOLUENEDIAMINE	17	1709
Methylphenylene diisocyanate	TOLUENE DIISOCYANATE	17	2078
4-methyl-1,3-phenylene diisocyanate	TOLUENE DIISOCYANATE	17	2078
4-Methyl-m-phenylene diisocyanate	TOLUENE DIISOCYANATE	17	2078
2-Methyl-2-phenylpropane	BUTYLBENZENE (ALL ISOMERS)	17	2709
2-Methylpropanal	BUTYRALDEHYDE (ALL ISOMERS)	17	1129
2-METHYL-1,3-PROPANEDIOL		17	
2-Methyl-1-propanol	ISOBUTYL ALCOHOL	17	1212
2-Methylpropan-1-ol	ISOBUTYL ALCOHOL	17	1212
2-Methylpropan-2-ol	TERT-BUTYL ALCOHOL	17	
2-Methyl-2-propanol	TERT-BUTYL ALCOHOL	17	
2-Methylprop-2-enenitrile	METHACRYLONITRILE	17	3079
2-Methylpropenoic acid	METHACRYLIC ACID	17	2531
alpha-Methylpropenoic acid	METHACRYLIC ACID	17	2531
2-Methylprop-1-enyl methyl ketone	MESITYL OXIDE	17	1229
2-Methylpropyl acrylate	BUTYL ACRYLATE (ALL ISOMERS)	17	2348
2-Methyl-1-propyl alcohol	ISOBUTYL ALCOHOL	17	1212
2-Methyl-2-propyl alcohol	TERT-BUTYL ALCOHOL	17	
Methylpropylbenzene	P-CYME	17	2046
Methylpropylcarbinol	SEC-AMYL ALCOHOL	17	
1-Methyl-1-propylethylene	HEXENE (ALL ISOMERS)	17	2370
2-Methylpropyl formate	ISOBUTYL FORMATE	17	2393
METHYL PROPYL KETONE		18	1249
2-METHYLPYRIDINE		17	2313
3-METHYLPYRIDINE		17	2313
4-METHYLPYRIDINE		17	2313
alpha-Methylpyridine	2-METHYLPYRIDINE	17	2313
1-Methylpyrrolidin-2-one	N-METHYL-2-PYRROLIDONE	17	
1-Methyl-2-pyrrolidinone	N-METHYL-2-PYRROLIDONE	17	
1-Methyl-2-pyrrolidinone	N-METHYL-2-PYRROLIDONE	17	
N-Methylpyrrolidinone	N-METHYL-2-PYRROLIDONE	17	
1-Methyl-2-pyrrolidone	N-METHYL-2-PYRROLIDONE	17	
N-METHYL-2-PYRROLIDONE		17	
METHYL SALICYLATE		17	
Methylstyrene	VINYLTOLUENE	17	2618
ALPHA-METHYLSTYRENE		17	2303
3-(METHYLTHIO)PROPIONALDEHYDE		17	
2-Methyltrimethylene glycol	2-METHYL-1,3-PROPANEDIOL	17	
Metolachlor	N-(2-METHOXY-1-METHYL ETHYL)-2-ETHYL -6-METHYL CHLOROACETANILIDE	17	
Middle oil	CARBOLIC OIL	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Milk acid	LACTIC ACID	17	
Milk of magnesia	MAGNESIUM HYDROXIDE SLURRY	18	
Mineral jelly	PETROLATUM	17	
Mineral wax	PETROLATUM	17	
Mixed aliphatic oxygenated hydrocarbons, primary aliphatic alcohols and aliphatic ethers: mol wt: >200	OXYGENATED ALIPHATIC HYDROCARBON MIXTURE	17	1993
MOLASSES		18	
MOLYBDENUM POLYSULFIDE LONG CHAIN ALKYL DITHIOCARBAMIDE COMPLEX		17	
Molybdenum Polysulfide Long Chain Alkyl Dithiocarbamide Complex		17	
Monochlorobenzene	CHLOROBENZENE	17	1134
Monochlorobenzol	CHLOROBENZENE	17	1134
Monoethanolamine	ETHANOLAMINE	17	2491
Monoethylamine	ETHYLAMINE	17	1036
Monoethylamine solutions, 72% or less	ETHYLAMINE SOLUTIONS (72% OR LESS)	17	2270
Monoisopropanolamine	ISOPROPANOLAMINE	17	
Monoisopropylamine	ISOPROPYLAMINE	17	1221
Monomethylamine	METHYLAMINE SOLUTIONS (42% OR LESS)	17	1235
Monomethylamine solutions, 42% or less	METHYLAMINE SOLUTIONS (42% OR LESS)	17	1235
Monopropylamine	N-PROPYLAMINE	17	1277
Monopropylene glycol	PROPYLENE GLYCOL	18	
MORPHOLINE		17	2054
MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)		17	1649
Muriatic acid	HYDROCHLORIC ACID	17	1789
MYRCENE		17	
Naphtha, coal tar	COAL TAR NAPHTHA SOLVENT	17	
NAPHTHALENE (MOLTEN)		17	2304
NAPHTHALENESULPHONIC ACID-FORMALDEHYDE COPOLYMER, SODIUM SALT SOLUTION		17	
Naphtha (petroleum), Light Steam-cracked Aromatics	ALKYLBENZENE MIXTURES (CONTAINING AT LEAST 50% OF TOLUENE)	17	
Naphtha safety solvent	WHITE SPIRIT, LOW (15-20%) AROMATIC	17	1300
NEODECANOIC ACID		17	
Neodecanoic acid, 2,3-epoxypropyl ester	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17	
Neodecanoic acid, glycidyl ester	GLYCIDYL ESTER OF C10 TRIALKYLACETIC ACID	17	
Neodecanoic acid vinyl ester	VINYL NEODECANOATE	17	
Neopentane	PENTANE (ALL ISOMERS)	17	1265
Neopentanoic acid	TRIMETHYLACETIC ACID	17	
Neopentylene glycol	2,2-DIMETHYLPROPANE-1,3-DIOL (MOLTEN OR SOLUTION)	17	
NITRATING ACID (MIXTURE OF SULPHURIC AND NITRIC ACIDS)		17	1796
NITRIC ACID (70% AND OVER)		17	2031, 2032
NITRIC ACID (LESS THAN 70%)		17	2031
Nitric acid, fuming	NITRIC ACID (70% AND OVER)	17	2031, 2032
Nitric acid, red fuming	NITRIC ACID (70% AND OVER)	17	2031, 2032
NITRILOTRIACETIC ACID, TRISODIUM SALT SOLUTION		17	
2,2',2''-Nitrilotriethanol	TRIETHANOLAMINE	17	
2,2',2'''-Nitrilotriethanol	TRIETHANOLAMINE	17	
Nitrilo-2,2',2''-triethanol	TRIETHANOLAMINE	17	
1,1',1''-Nitrilotripropan-2-ol	TRIISOPROPANOLAMINE	17	
1,1',1'''-Nitrilotripropan-2-ol	TRIISOPROPANOLAMINE	17	
1,1',1'''-Nitrilotri-2-propanol	TRIISOPROPANOLAMINE	17	
NITROBENZENE		17	1662
Nitrobenzol	NITROBENZENE	17	1662
o-Nitrochlorobenzene	O-CHLORONITROBENZENE	17	1578

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
NITROETHANE		17	2842
NITROETHANE(80%)/NITROPROPANE(20%)		17	
NITROETHANE, 1-NITROPROPANE (EACH 15% OR MORE) MIXTURE		17	
ortho-Nitrophenol	O-NITROPHENOL (MOLTEN)	17	1663
2-Nitrophenol	O-NITROPHENOL (MOLTEN)	17	1663
2-Nitrophenol (molten)	O-NITROPHENOL (MOLTEN)	17	1663
o-Nitrophenol	O-NITROPHENOL (MOLTEN)	17	1663
O-NITROPHENOL (MOLTEN)		17	1663
1- OR 2-NITROPROPANE		17	2608
NITROPROPANE (60%)/NITROETHANE (40%) MIXTURE		17	
2-Nitrotoluene	O- OR P-NITROTOLUENES	17	1664
4-Nitrotoluene	O- OR P-NITROTOLUENES	17	1664
o-Nitrotoluene	O- OR P-NITROTOLUENES	17	1664
p-Nitrotoluene	O- OR P-NITROTOLUENES	17	1664
O- OR P-NITROTOLUENES		17	1664
NONANE (ALL ISOMERS)		17	1920
1-Nonanecarboxylic acid	DECANOIC ACID	17	
n-Nonane	NONANE (ALL ISOMERS)	17	1920
NONANOIC ACID (ALL ISOMERS)		17	
Nonanols	NONYL ALCOHOL (ALL ISOMERS)	17	
NON-EDIBLE INDUSTRIAL GRADE PALM OIL		17	
NONENE (ALL ISOMERS)		17	
NONYL ALCOHOL (ALL ISOMERS)		17	
Nonylcarbinol	DECYL ALCOHOL (ALL ISOMERS)	17	
Nonylene	NONENE (ALL ISOMERS)	17	
Nonyl hydride	NONANE (ALL ISOMERS)	17	1920
NONYL METHACRYLATE MONOMER		17	
NONYLPHENOL		17	
NONYLPHENOL POLY(4+)ETHOXYLATE		17	
alpha-4-Nonylphenyl-omega-hydroxypoly(oxyethylene)	ALKARYL POLYETHERS (C9-C20)	17	
Nopinen	BETA-PINENE	17	2368
Nopinene	BETA-PINENE	17	2368
NOXIOUS LIQUID, NF, (1) N.O.S. (TRADE NAME, CONTAINS) ST1, CAT. X		17	
NOXIOUS LIQUID, F, (2) N.O.S. (TRADE NAME, CONTAINS) ST1, CAT. X		17	
NOXIOUS LIQUID, NF, (3) N.O.S. (TRADE NAME, CONTAINS) ST2, CAT. X		17	
NOXIOUS LIQUID, F, (4) N.O.S. (TRADE NAME, CONTAINS) ST2, CAT. X		17	
NOXIOUS LIQUID, NF, (5) N.O.S. (TRADE NAME, CONTAINS) ST2, CAT. Y		17	
NOXIOUS LIQUID, F, (6) N.O.S. (TRADE NAME, CONTAINS) ST2, CAT. Y		17	
NOXIOUS LIQUID, NF, (7) N.O.S. (TRADE NAME, CONTAINS) ST3, CAT. Y		17	
NOXIOUS LIQUID, F, (8) N.O.S. (TRADE NAME, CONTAINS) ST3, CAT. Y		17	
NOXIOUS LIQUID, NF, (9) N.O.S. (TRADE NAME, CONTAINS) ST3, CAT. Z		17	
NOXIOUS LIQUID, F, (10) N.O.S. (TRADE NAME, CONTAINS) ST3, CAT. Z		17	
NOXIOUS LIQUID, (11) N.O.S. (TRADE NAME, CONTAINS) CAT. Z		18	
NON-NOXIOUS LIQUID, (12) N.O.S. (TRADE NAME, CONTAINS) CAT. OS		18	
1-Octadecanol	ALCOHOLS (C13+)	17	
Octadecan-1-ol	ALCOHOLS (C13+)	17	
Octanal	OCTYL ALDEHYDES	17	1991

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
OCTANE (ALL ISOMERS)		17	1262
OCTANOIC ACID (ALL ISOMERS)		17	
OCTANOL (ALL ISOMERS)		17	
Octan-1-ol	OCTANOL (ALL ISOMERS)	17	
OCTENE (ALL ISOMERS)		17	
Octic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Octoic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Octyl acetate	N-OCTYL ACETATE	17	
N-OCTYL ACETATE		17	
Octyl acrylate	2-ETHYLHEXYL ACRYLATE	17	
Octyl adipate	DI-(2-ETHYLHEXYL) ADIPATE	17	
Octyl alcohol	OCTANOL (ALL ISOMERS)	17	
OCTYL ALDEHYDES		17	1191
Octylcarbinol	NONYL ALCOHOL (ALL ISOMERS)	17	
OCTYL DECYL ADIPATE		17	
Octyl decyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
Octylic acid	OCTANOIC ACID (ALL ISOMERS)	17	
Octyl nitrate	ALKYL (C7-C9) NITRATES	17	
Octyl nitrates (all isomers)	ALKYL (C7-C9) NITRATES	17	
Octyl phthalate	DIALKYL (C7-C13) PHTHALATES	17	
Oenanthic acid	N-HEPTANOIC ACID	17	
Oenanthylic acid	N-HEPTANOIC ACID	17	
Oil of Mirbane	NITROBENZENE	17	1662
Oil of Myrbane	NITROBENZENE	17	1662
Oil of turpentine	TURPENTINE	17	1299
Oil of vitriol	SULPHURIC ACID	17	1830
Oil of wintergreen	METHYL SALICYLATE	17	
Oleamine	OLEYLAMINE	17	
OLEFIN-ALKYL ESTER COPOLYMER (MOLECULAR WEIGHT 2000+)		17	
OLEFIN MIXTURES (C5-C7)		17	
OLEFIN MIXTURES (C5-C15)		17	
OLEFINS (C13+, ALL ISOMERS)		17	
ALPHA-OLEFINS (C6-C18) MIXTURES		17	
OLEIC ACID		17	
OLEUM		17	1831
OLEYLAMINE		17	
OLIVE OIL		17	
Orthophosphoric acid	PHOSPHORIC ACID	17	1805
Oxal	GLYOXAL SOLUTION (40% OR LESS)	17	
Oxaldehyde	GLYOXAL SOLUTION (40% OR LESS)	17	
3-Oxapentane-1,5-diol	DIETHYLENE GLYCOL	18	
1,4-Oxazinane	MORPHOLINE	17	2054
2-Oxetanone	BETA-PROPIOLACTONE	17	
Oxoacetic acid	GLYOXYLIC ACID SOLUTION (50% OR LESS)	17	1760
Oxoethanoic acid	GLYOXYLIC ACID SOLUTION (50% OR LESS)	17	1760
2,2'-Oxybis(1-chloropropane)	2,2'-DICHLOROISOPROPYL ETHER	17	2490
2,2'-Oxybis(ethyleneoxy)diethanol	TETRAETHYLENE GLYCOL	17	
2,2'-Oxybispropane	ISOPROPYL ETHER	17	1159
2,2'-Oxydiethanol	DIETHYLENE GLYCOL	18	
1,1'-Oxydipropan-2-ol	DIPROPYLENE GLYCOL	17	
Oxyethanoic acid	GLYCOLIC ACID SOLUTION (70% OR LESS)	17	3265
OXYGENATED ALIPHATIC HYDROCARBON MIXTURE		17	1993
Oxymethylene	FORMALDEHYDE SOLUTIONS (45% OR LESS)	17	1198, 2209
PALM ACID OIL		17	
PALM FATTY ACID DISTILLATE		17	
PALM KERNEL ACID OIL		17	
PALM KERNEL OIL		17	
PALM KERNEL OLEIN		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
PALM KERNEL STEARIN		17	
PALM MID-FRACTION		17	
PALM OIL		17	
PALM OIL FATTY ACID METHYL ESTER		17	
PALM OLEIN		17	
PALM STEARIN	17		
Paraffin	PARAFFIN WAX	17	
Paraffin jelly	PETROLATUM	17	
Paraffin scale	PARAFFIN WAX	17	
n-Paraffins (C10-C20)	N-ALKANES (C10+)	17	
PARAFFIN WAX		17	
PARALDEHYDE		17	1264
PARALDEHYDE-AMMONIA REACTION PRODUCT		17	2920
Pear oil	AMYL ACETATE (ALL ISOMERS)	17	1104
Pelargonic acid	NONANOIC ACID (ALL ISOMERS)	17	
Pelargonic alcohol	NONYL ALCOHOL (ALL ISOMERS)	17	
PENTACHLOROETHANE		17	1669
Pentadecanol	ALCOHOLS (C13+)	17	
1-Pentadecene	OLEFINS (C13+, ALL ISOMERS)	17	
Pentadec-1-ene	OLEFINS (C13+, ALL ISOMERS)	17	
1,3-PENTADIENE		17	
Penta-1,3-diene	1,3-PENTADIENE	17	
Pentaethylene glycol	POLYETHYLENE GLYCOL	17	
PENTAETHYLENEHEXAMINE		17	
Pentalin	PENTACHLOROETHANE	17	1669
Pentamethylene	CYCLOPENTANE	17	1146
2,2,4,6,6-Pentamethyl-4-heptanethiol	TERT-DODECANETHIOL	17	
Pentanal	VALERALDEHYDE (ALL ISOMERS)	17	2058
Pentane	PENTANE (ALL ISOMERS)	17	1265
PENTANE (ALL ISOMERS)		17	1265
Pentanedial solutions, 50% or less	GLUTARALDEHYDE SOLUTIONS (50% OR LESS)	17	
n-Pentane	PENTANE (ALL ISOMERS)	17	1265
PENTANOIC ACID		17	
N-PENTANOIC ACID (64%)/2-METHYL BUTYRIC ACID (36%) MIXTURE		17	
tert-Pentanoic acid	TRIMETHYLACETIC ACID	17	
1-Pentanol	N-AMYL ALCOHOL	17	
Pentan-1-ol	N-AMYL ALCOHOL	17	
2-Pentanol	SEC-AMYL ALCOHOL	17	
Pentan-2-ol	SEC-AMYL ALCOHOL	17	
3-Pentanol	SEC-AMYL ALCOHOL	17	
Pentan-3-ol	SEC-AMYL ALCOHOL	17	
1-Pentanol acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
n-Pentanol	N-AMYL ALCOHOL	17	
sec-Pentanol	SEC-AMYL ALCOHOL	17	
tert-Pentanol	TERT-AMYL ALCOHOL	17	
2-Pentanone	METHYL PROPYL KETONE	18	1249
Pentan-2-one	METHYL PROPYL KETONE	18	1249
Pentasodium diethylenetriaminepentaacetate	DIETHYLENTRIAMINEPENTAACETIC ACID, PENTASODIUM SALT SOLUTION	17	
PENTENE (ALL ISOMERS)		17	
Pent-1-ene	PENTENE (ALL ISOMERS)	17	
n-Pentene	PENTENE (ALL ISOMERS)	17	
Pentenenes	PENTENE (ALL ISOMERS)	17	
Pentyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
sec-Pentyl acetate	AMYL ACETATE (ALL ISOMERS)	17	1104
Pentyl alcohol	N-AMYL ALCOHOL	17	
sec-Pentyl alcohol	SEC-AMYL ALCOHOL	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
tert-Pentyl alcohol	TERT-AMYL ALCOHOL	17	
Pentyl propanoate	N-PENTYL PROPIONATE	17	1993
N-PENTYL PROPIONATE		17	1993
PERCHLOROETHYLENE		17	1897
Perchloromethane	CARBON TETRACHLORIDE	17	1846
Perhydroazepine	HEXAMETHYLENEIMINE	17	2493
PETROLATUM		17	
Petroleum jelly	PETROLATUM	17	
Phene	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
Phenic acid	PHENOL	17	2312
PHENOL		17	2312
2-Phenoxyethanol	ETHYLENE GLYCOL PHENYL ETHER	17	
Phenyl alkane(C10-C21)sulphonate	ALKYL SULPHONIC ACID ESTER OF PHENOL	17	
Phenylamine	ANILINE	17	1547
N-Phenyl aniline	DIPHENYLAMINE(MOLTEN)	17	
N-Phenylbenzenamine	DIPHENYLAMINE(MOLTEN)	17	
1-Phenylbutane	BUTYLBENZENE (ALL ISOMERS)	17	2709
2-Phenylbutane	BUTYLBENZENE (ALL ISOMERS)	17	2709
Phenyl carbinol	BENZYL ALCOHOL	17	
Phenyl 'cellosolve'	ETHYLENE GLYCOL PHENYL ETHER	17	
Phenyl chloride	CHLOROBENZENE	17	1134
1-Phenyldecane	ALKYL(C9+)BENZENES	17	
1-Phenyldodecane	ALKYL(C9+)BENZENES	17	
Phenylethane	ETHYLBENZENE	17	1175
Phenyl ether	DIPHENYL ETHER	17	
Phenylethylene	STYRENE MONOMER	17	2055
1-Phenylethylxylene	1-PHENYL-1-XYLYL ETHANE	17	
Phenyl hydride	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
Phenyl hydroxide	PHENOL	17	2312
Phenylic acid	PHENOL	17	2312
Phenylmethane	TOLUENE	17	1294
Phenylmethanol	BENZYL ALCOHOL	17	
Phenylmethyl acetate	BENZYL ACETATE	17	
1-Phenylpropane	PROPYLBENZENE (ALL ISOMERS)	17	
2-Phenylpropane	PROPYLBENZENE (ALL ISOMERS)	17	
2-Phenylpropene	ALPHA-METHYLSTYRENE	17	2303
1-Phenyltetradecane	ALKYL(C9+)BENZENES	17	
1-Phenyltridecane	ALKYL(C9+)BENZENES	17	
1-Phenylundecane	ALKYL(C9+)BENZENES	17	
Phenylxylethane	1-PHENYL-1-XYLYL ETHANE	17	
1-PHENYL-1-XYLYL ETHANE		17	
1-Phenyl-1-(2,5-xylyl)ethane	1-PHENYL-1-XYLYL ETHANE	17	
1-Phenyl-1-(3,4-xylyl)ethane	1-PHENYL-1-XYLYL ETHANE	17	
PHOSPHATE ESTERS, ALKYL (C12-C14) AMINE		17	2053
L-alpha-Phosphatidyl choline	LECITHIN	18	
N-(phosphonomethyl)glycine	GLYPHOSATE SOLUTION (NOT CONTAINING SURFACTANT)	17	
PHOSPHORIC ACID		17	1805
PHOSPHOROUS, YELLOW OR WHITE		17	1381, 2447
Phthalandione	PHTHALIC ANHYDRIDE (MOLTEN)	17	2214
Phthalic acid anhydride	PHTHALIC ANHYDRIDE (MOLTEN)	17	2214
Phthalic acid, diundecyl ester	DIUNDECYL PHTHALATE	17	
PHTHALIC ANHYDRIDE (MOLTEN)		17	2214
2-Picoline	2-METHYLPYRIDINE	17	2313
3-Picoline	3-METHYLPYRIDINE	17	2313
4-Picoline	4-METHYLPYRIDINE	17	2313

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
alpha-Picoline	2-METHYLPYRIDINE	17	2313
beta-Picoline	3-METHYLPYRIDINE	17	2313
gamma-Picoline	4-METHYLPYRIDINE	17	2313
Pimelic ketone	CYCLOHEXANONE	17	1915
2-Pinene	ALPHA-PINENE	17	2368
2(10)-Pinene	BETA-PINENE	17	2368
ALPHA-PINENE		17	2368
BETA-PINENE		17	2368
PINE OIL		17	1272
2-Piperazin-1-ylethylamine	N-AMINOETHYLPIPERAZINE	17	2815
Piperylene	1,3-PENTADIENE	17	
Pivalic acid	TRIMETHYLACETIC ACID	17	
Poly(oxyethyleneoxyethyleneoxyphthaloyl)	DIETHYLENE GLYCOL PHTHALATE	17	
Poly(propylene oxide)	POLYPROPYLENE GLYCOL	17	
Poly(sodium carboxylatoethylene)	SODIUM POLY(4+)ACRYLATE SOLUTIONS	17	
POLYACRYLIC ACID SOLUTION (40% OR LESS)		17	
POLYALKYL (C18-C22) ACRYLATE IN XYLENE		17	
POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER		17	
POLY(2-8)ALKYLENE GLYCOL MONOALKYL (C1-C6) ETHER ACETATE		17	
Poly (2-8) alkylene (C2-C3) glycols / Polyalkylene (C2-C10) glycol monoalkyl (C1-C4) ethers and their borate esters	BRAKE FLUID BASE MIX: POLY(2-8) ALKYLENE (C2-C3) GLYCOLS/POLYALKYLENE (C2-C10) GLYCOLS MONOALKYL (C1-C4) ETHERS AND THEIR BORATE ESTERS	17	
POLYALKYL (C10-C20) METHACRYLATE		17	
POLYALKYL (C10-C18) METHACRYLATE/ETHYLENE-PROPYLENE COPOLYMER MIXTURE		17	3257
POLYALUMINIUM CHLORIDE SOLUTION		18	
POLYBUTENE		17	
POLYBUTENYL SUCCINIMIDE		17	
POLY(2+)CYCLIC AROMATICS		17	
POLYETHER (MOLECULAR WEIGHT 1350+)		17	
POLYETHYLENE GLYCOL		17	
Poly(4-12)ethylene glycol alkyl(C7-C11)phenyl ether	NONYLPHENOL POLY(4+)ETHOXYLATE	17	
POLYETHYLENE GLYCOL DIMETHYL ETHER		17	
Polyethylene glycols, mono(p-nonylphenyl) ether	ALKARYL POLYETHERS (C9-C20)	17	
Poly[ethylene oxide]	POLYETHER (MOLECULAR WEIGHT 1350+)	17	
POLYETHYLENE POLYAMINES		17	
POLYETHYLENE POLYAMINES (MORE THAN 50% C5-C20 PARAFFIN OIL)		17	2734(i) 2735
Polyethylene polyamines (in C5-C20 paraffin oil)	POLYETHYLENE POLYAMINES (MORE THAN 50% C5-C20 PARAFFIN OIL)	17	2734(i) 2735
POLYFERRIC SULPHATE SOLUTION		17	
Polyglucitol	HYDROGENATED STARCH HYDROLYSATE	18	
POLYGLYCERIN, SODIUM SALT SOLUTION (CONTAINING LESS THAN 3% SODIUM HYDROXIDE)		18	
Polyglycitol syrup	HYDROGENATED STARCH HYDROLYSATE	18	
POLY(IMINOETHYLENE)-GRAFT-N-POLY (ETHYLENEOXY) SOLUTION (90% OR LESS)		17	
POLYISOBUTENAMINE IN ALIPHATIC (C10-C14) SOLVENT		17	
POLYISOBUTENYL ANHYDRIDE ADDUCT		17	
Polyisobutylene	POLY(4+)ISOBUTYLENE	17	
POLY(4+)ISOBUTYLENE		17	
POLYMETHYLENE POLYPHENYL ISOCYANATE		17	2206(i) 2207
POLYOLEFIN (MOLECULAR WEIGHT 300+)		17	
POLYOLEFIN AMIDE ALKENEAMINE (C17+)		17	
POLYOLEFIN AMIDE ALKENEAMINE BORATE (C28-C250)		17	
POLYOLEFINAMINE (C28-C250)		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
POLYOLEFINAMINE IN ALKYL (C2-C4) BENZENES		17	
POLYOLEFINAMINE IN AROMATIC SOLVENT		17	
POLYOLEFIN AMINOESTER SALTS (MOLECULAR WEIGHT 2000+)		17	
POLYOLEFIN ANHYDRIDE		17	
POLYOLEFIN ESTER (C28-C250)		17	
POLYOLEFIN PHENOLIC AMINE (C28-C250)		17	
POLYOLEFIN PHOSPHOROSULPHIDE, BARIUM DERIVATIVE (C28-C250)		17	
Poly[oxyethylene]	POLYETHER (MOLECULAR WEIGHT 1350+)	17	
POLY(20)OXYETHYLENE SORBITAN MONOOLEATE		17	
poly[oxy-p-phenylenemethylene-p-phenyleneoxy (2-hydroxytrimethylene)]	DIGLYCIDYL ETHER OF BISPHENOL F	17	
Poly[oxypropylene]	POLYETHER (MOLECULAR WEIGHT 1350+)	17	
poly[(phenyl isocyanate)-alt-formaldehyde]	POLYMETHYLENE POLYPHENYL ISOCYANATE	17	2206(i) 2207
Poly[(phenyl isocyanate)-co-formaldehyde]	POLYMETHYLENE POLYPHENYL ISOCYANATE	17	2206(i) 2207
Polyphenyl-polymethylene isocyanate	POLYMETHYLENE POLYPHENYL ISOCYANATE	17	2206(i) 2207
Poly[propene oxide]	POLYETHER (MOLECULAR WEIGHT 1350+)	17	
Polypropylene	POLY(5+)PROPYLENE	17	
POLY(5+)PROPYLENE		17	
POLYPROPYLENE GLYCOL		17	
POLYSILOXANE		17	
Potassium chloride drilling brine	POTASSIUM CHLORIDE SOLUTION	17	
POTASSIUM CHLORIDE SOLUTION		17	
POTASSIUM FORMATE SOLUTIONS		18	
POTASSIUM HYDROXIDE SOLUTION		17	1814
POTASSIUM OLEATE		17	
POTASSIUM THIOSULPHATE (50% OR LESS)		17	
Propanal	PROPIONALDEHYDE	17	1275
Propan-1-amine	N-PROPYLAMINE	17	1277
2-Propanamine	ISOPROPYLAMINE	17	1221
1,2-Propanediol	PROPYLENE GLYCOL	18	
Propane-1,2-diol	PROPYLENE GLYCOL	18	
1,2-Propanediol cyclic carbonate	PROPYLENE CARBONATE	18	
Propanenitrile	PROPIONITRILE	17	2404
1,2,3-Propanetriol	GLYCERINE	18	
Propane-1,2,3-triol	GLYCERINE	18	
1,2,3-Propane triol triacetate	GLYCERYL TRIACETATE	17	
Propanoic acid	PROPIONIC ACID	17	1848
Propanoic anhydride	PROPIONIC ANHYDRIDE	17	2496
Propanol	N-PROPYL ALCOHOL	17	1274
1-Propanol	N-PROPYL ALCOHOL	17	1274
Propan-1-ol	N-PROPYL ALCOHOL	17	1274
2-Propanol	ISOPROPYL ALCOHOL	18	
Propan-2-ol	ISOPROPYL ALCOHOL	18	
N-PROPANOLAMINE		17	
3-Propanolide	BETA-PROPIOLACTONE	17	
n-Propanol	N-PROPYL ALCOHOL	17	1274
Propanone	ACETONE	18	
2-Propanone	ACETONE	18	
Propan-2-one	ACETONE	18	
Propenamide solution, 50% or less	ACRYLAMIDE SOLUTION (50% OR LESS)	17	2074
Propenenitrile	ACRYLONITRILE	17	1093
Propene oxide	PROPYLENE OXIDE	17	1280
Propenoic acid	ACRYLIC ACID	17	2218
2-Propenoic acid, homopolymer solution (40% or less)	POLYACRYLIC ACID SOLUTION (40% OR LESS)	17	
1-Propenol-3	ALLYL ALCOHOL	17	1098
2-Propen-1-ol	ALLYL ALCOHOL	17	1098

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Prop-2-en-1-ol	ALLYL ALCOHOL	17	1098
Propenyl alcohol	ALLYL ALCOHOL	17	1098
Propiolactone	BETA-PROPIOLACTONE	17	
BETA-PROPIOLACTONE		17	
PROPIONALDEHYDE		17	1275
PROPIONIC ACID		17	1848
Propionic aldehyde	PROPIONALDEHYDE	17	1275
PROPIONIC ANHYDRIDE		17	2496
PROPIONITRILE		17	2404
beta-Propionolactone	BETA-PROPIOLACTONE	17	
Propionitrile	PROPIONITRILE	17	2404
Propionyl oxide	PROPIONIC ANHYDRIDE	17	2496
1-Propoxypropan-2-ol	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Propyl acetate	N-PROPYL ACETATE	17	
N-PROPYL ACETATE		17	
Propyl acetone	METHYL BUTYL KETONE	17	1224
Propyl alcohol	N-PROPYL ALCOHOL	17	1274
2-Propyl alcohol	ISOPROPYL ALCOHOL	18	
N-PROPYL ALCOHOL		17	1274
sec-Propyl alcohol	ISOPROPYL ALCOHOL	18	
Propyl aldehyde	PROPIONALDEHYDE	17	1275
Propylamine	N-PROPYLAMINE	17	1277
N-PROPYLAMINE		17	1277
PROPYLBENZENE (ALL ISOMERS)		17	
n-Propylbenzene	PROPYLBENZENE (ALL ISOMERS)	17	
Propylcarbinol	N-BUTYL ALCOHOL	18	
Propylene aldehyde	CROTONALDEHYDE	17	1143
2,2'-[Propylenebis(nitrilomethylene)]diphenol	ALKYL (C8-C9) PHENYLAMINE IN AROMATIC SOLVENTS	17	1993
PROPYLENE CARBONATE		18	
Propylene chloride	1,2-DICHLOROPROPANE	17	1279
Propylene dichloride	1,2-DICHLOROPROPANE	17	1279
alpha,alpha'- (Propylenedinitrilo)di-o-cresol	ALKYL (C8-C9) PHENYLAMINE IN AROMATIC SOLVENTS	17	1993
Propylene epoxide	PROPYLENE OXIDE	17	1280
PROPYLENE GLYCOL		18	
1,2-Propylene glycol	PROPYLENE GLYCOL	18	
Propylene glycol n-butyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Propylene glycol ethyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Propylene glycol methyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
PROPYLENE GLYCOL METHYL ETHER ACETATE		17	
PROPYLENE GLYCOL MONOALKYL ETHER		17	
Propylene glycol monobutyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Propylene glycol monomethyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
PROPYLENE GLYCOL PHENYL ETHER		17	
Propylene glycol propyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
Propylene glycol trimer	TRIPROPYLENE GLYCOL	17	
1,2-Propylene glycol trimer	TRIPROPYLENE GLYCOL	17	
Propylene glyco beta-monoethyl ether	PROPYLENE GLYCOL MONOALKYL ETHER	17	
PROPYLENE OXIDE		17	1280
PROPYLENE TETRAMER		17	2850
PROPYLENE TRIMER		17	2057
Propylethylene	PENTENE (ALL ISOMERS)	17	
Propyl methyl ketone	METHYL PROPYL KETONE	18	1249
N-Propyl-1-propanamine	DI-N-PROPYLAMINE	17	2383
Pseudobutylene glycol	BUTYLENE GLYCOL	17	
Pseudocumene	TRIMETHYLBENZENE (ALL ISOMERS)	17	
Pseudopinen	BETA-PINENE	17	2368

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Psuedopinene	BETA-PINENE	17	2368
Pygas	PYROLYSIS GASOLINE (CONTAINING BENZENE)	17	
PYRIDINE		17	1282
Pyroacetic acid	ACETONE	18	
Pyroacetic ether	ACETONE	18	
PYROLYSIS GASOLINE (CONTAINING BENZENE)		17	
Pyrolysis gasoline (steam-cracked naphtha)	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
Pyrolysis gasoline, containing 10% or more benzene	BENZENE AND MIXTURES HAVING 10% BENZENE OR MORE (I)	17	1114
Pyromucic aldehyde	FURFURAL	17	1199
RAPESEED OIL		17	
RAPESEED OIL (LOW ERUCIC ACID, CONTAINING LESS THAN 4% FREE FATTY ACIDS)		17	
RAPE SEED OIL FATTY ACID METHYL ESTERS		17	
RESIN OIL, DISTILLED		17	
RICE BRAN OIL		17	
ROSIN		17	
Rubbing alcohol	ISOPROPYL ALCOHOL	18	
Safety solvent	WHITE SPIRIT, LOW (15-20%) AROMATIC	17	1300
SAFFLOWER OIL		17	
Saturated fatty acid (C13 and above)	FATTY ACID (SATURATED C13+)	17	
SHEA BUTTER		17	
Silvite	POTASSIUM CHLORIDE SOLUTION	17	
Sludge acid	SULPHURIC ACID, SPENT	17	1832
Soda ash	SODIUM CARBONATE SOLUTION	17	
Soda lye	SODIUM HYDROXIDE SOLUTION	17	1824
SODIUM ACETATE SOLUTIONS		18	
Sodium acid sulphite	SODIUM HYDROGEN SULPHITE SOLUTION (45% OR LESS)	17	2693
Sodium alkylbenzene sulphonate	ALKYLBENZENE SULPHONIC ACID, SODIUM SALT SOLUTION	17	
SODIUM ALKYL (C14-C17) SULPHONATES (60-65% SOLUTION)		17	
SODIUM ALUMINOSILICATE SLURRY		17	
Sodium aminoacetate solution	GLYCINE, SODIUM SALT SOLUTION	17	
SODIUM BENZOATE		17	
Sodium 1,3-benzothiazole-2-thiolate solution	MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION	17	
Sodium 1,3-benzothiazol-2-yl sulphide solution	MERCAPTOBENZOTHAZOL, SODIUM SALT SOLUTION	17	
Sodium bichromate	SODIUM DICHROMATE SOLUTION (70% OR LESS)	17	
Sodium bisulphide	SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS)	17	2949
SODIUM BOROHYDRIDE (15% OR LESS)/SODIUM HYDROXIDE SOLUTION		17	
SODIUM CARBONATE SOLUTION		17	
SODIUM CHLORATE SOLUTION (50% OR LESS)		17	2428
Sodium cresylate	CRESYLIC ACID, SODIUM SALT SOLUTION	17	
SODIUM DICHROMATE SOLUTION (70% OR LESS)		17	
Sodium glycinate solution	GLYCINE, SODIUM SALT SOLUTION	17	
Sodium hydrate	SODIUM HYDROXIDE SOLUTION	17	1824
Sodium hydrosulphide	SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS)	17	2949
SODIUM HYDROGEN SULPHIDE (6% OR LESS)/SODIUM CARBONATE (3% OR LESS) SOLUTION		17	
SODIUM HYDROGEN SULPHITE SOLUTION (45% OR LESS)		17	2693
SODIUM HYDROSULPHIDE/AMMONIUM SULPHIDE SOLUTION		17	
SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS)		17	2949

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
SODIUM HYDROXIDE SOLUTION		17	1824
SODIUM HYPOCHLORITE SOLUTION (15% OR LESS)		17	1791
Sodium lignosulphonate	LIGNINSULPHONIC ACID, SODIUM SALT SOLUTION	17	3806
Sodium mercaptan	SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS)	17	2949
Sodium mercaptide	SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS)	17	2949
Sodium methylcarbomodithioate	METAM SODIUM SOLUTION	17	
Sodium N-methyldithiocarbamate	METAM SODIUM SOLUTION	17	
Sodium methyldithiocarbamate solution	METAM SODIUM SOLUTION	17	
SODIUM NITRITE SOLUTION		17	1500
SODIUM PETROLEUM SULPHONATE		17	
SODIUM POLY(4+)ACRYLATE SOLUTIONS		17	
Sodium rhodanate	SODIUM THIOCYANATE SOLUTION (56% OR LESS)	17	
Sodium rhodanide	SODIUM THIOCYANATE SOLUTION (56% OR LESS)	17	
Sodium salt of sulphonated naphthalene-formaldehyde condensate	NAPHTHALENESULPHONIC ACID-FORMALDEHYDE COPOLYMER, SODIUM SALT SOLUTION	17	
SODIUM SILICATE SOLUTION		17	
SODIUM SULPHATE SOLUTIONS		18	
SODIUM SULPHIDE SOLUTION (15% OR LESS)		17	1385
SODIUM SULPHITE SOLUTION (25% OR LESS)		17	
Sodium sulphocyanate	SODIUM THIOCYANATE SOLUTION (56% OR LESS)	17	
Sodium sulphocyanide	SODIUM THIOCYANATE SOLUTION (56% OR LESS)	17	
Sodium sulphhydrate	SODIUM HYDROSULPHIDE SOLUTION (45% OR LESS)	17	2949
Sodium tetrahydroborate (15% or less) / sodium hydroxide solution	SODIUM BOROHYDRIDE (15% OR LESS)/SODIUM HYDROXIDE SOLUTION	17	
SODIUM THIOCYANATE SOLUTION (56% OR LESS)		17	
Sodium tolyl oxides	CRESYLIC ACID, SODIUM SALT SOLUTION	17	
'D-D Soil fumigant'	DICHLOROPROPENE/DICHLOROPROPANE MIXTURES	17	
d-Sorbitol	SORBITOL SOLUTION	18	
d-Sorbitol	SORBITOL SOLUTION	18	
SORBITOL SOLUTION		18	
SOYABEAN OIL		17	
Spirit of turpentine	TURPENTINE	17	1299
Spirits of wine	ETHYL ALCOHOL	18	
Stoddard solvent	WHITE SPIRIT, LOW (15-20%) AROMATIC	17	1300
STYRENE MONOMER		17	2055
Styrol	STYRENE MONOMER	17	2055
Suberane	CYCLOHEPTANE	17	2241
Sulfonic acid, alkane(C10-C21) phenyl ester	ALKYL SULPHONIC ACID ESTER OF PHENOL	17	
SULPHOHYDROCARBON (C3-C88)		17	
SULPHOLANE		17	
SULPHONATED POLYACRYLATE SOLUTION		18	
SULPHUR (MOLTEN)		17	2448
SULPHURIC ACID		17	1830
Sulphuric acid, fuming	OLEUM	17	1831
SULPHURIC ACID, SPENT		17	1832
Sulphuric chlorohydrin	CHLOROSULPHONIC ACID	17	1754
Sulphuric ether	DIETHYL ETHER	17	1155
SULPHURIZED FAT (C14-C20)		17	
SULPHURIZED POLYOLEFINAMIDE ALKENE (C28-C250) AMINE		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
SUNFLOWER SEED OIL		17	
Sweet-birch oil	METHYL SALICYLATE	17	
sym-Dichloroethane	ETHYLENE DICHLORIDE	17	1184
sym-Dichloroethyl ether	DICHLOROETHYL ETHER	17	1916
sym-Dimethylethylene glycol	BUTYLENE GLYCOL	17	
sym-Tetrachloroethane	TETRACHLOROETHANE	17	1702
sym-Trichlorobenzene	1,2,4-TRICHLOROBENZENE	17	2321
sym-Trioxane	1,3,5-TRIOXANE	17	
TALL OIL, CRUDE		17	
TALL OIL, DISTILLED		17	
TALL OIL FATTY ACID (RESIN ACIDS LESS THAN 20%)		17	
TALL OIL PITCH		17	
TALLOW		17	
TALLOW FATTY ACID		17	
Tar acids	CRESOLS (ALL ISOMERS)	17	2076
Tar camphor	NAPHTHALENE (MOLTEN)	17	2304
Terebenthene	BETA-PINENE	17	2368
3,6,9,12-Tetraazatetradecamethylenediamine	PENTAETHYLENEHEXAMINE	17	
3,6,9,12-Tetraazatetradecane-1,14-diamine	PENTAETHYLENEHEXAMINE	17	
1,3,5,7-Tetraazatricyclo[3.3.1.1 ^{3,7}]-decane	HEXAMETHYLENETETRAMINE SOLUTIONS	18	
TETRACHLOROETHANE		17	1702
1,1,2,2-Tetrachloroethane	TETRACHLOROETHANE	17	1702
Tetrachloroethylene	PERCHLOROETHYLENE	17	1897
1,1,2,2-tetrachloroethylene	PERCHLOROETHYLENE	17	1897
Tetrachloromethane	CARBON TETRACHLORIDE	17	1846
1-Tetradecanol	ALCOHOLS (C13+)	17	
Tetradecan-1-ol	ALCOHOLS (C13+)	17	
Tetradecene	OLEFINS (C13+, ALL ISOMERS)	17	
Tetradecylbenzene	ALKYL(C9+)BENZENES	17	
TETRAETHYLENE GLYCOL		17	
TETRAETHYLENE PENTAMINE		17	2320
Tetraethyllead	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
Tetraethylplumbane	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
TETRAETHYL SILICATE MONOMER/OLIGOMER (20% IN ETHANOL)		18	
3a,4,7,7a-Tetrahydro-3,5-dimethyl-4,7-methano-1H-indene	METHYLCYCLOPENTADIENE DIMER	17	
TETRAHYDROFURAN		17	2056
TETRAHYDRONAPHTHALENE		17	
1,2,3,4-Tetrahydronaphthalene	TETRAHYDRONAPHTHALENE	17	
Tetrahydro-1,4-oxazine	MORPHOLINE	17	2054
Tetrahydro-2H-1,4-oxazine	MORPHOLINE	17	2054
2H-Tetrahydro-1,4-oxazine	MORPHOLINE	17	2054
Tetrahydrothiophene-1-dioxide	SULPHOLANE	17	
Tetrahydrothiophene 1,1-dioxide	SULPHOLANE	17	
Tetralin	TETRAHYDRONAPHTHALENE	17	
TETRAMETHYLBENZENE (ALL ISOMERS)		17	
1,2,3,4-Tetramethylbenzene	TETRAMETHYLBENZENE (ALL ISOMERS)	17	
1,2,3,5-Tetramethylbenzene	TETRAMETHYLBENZENE (ALL ISOMERS)	17	
1,2,4,5-Tetramethylbenzene	TETRAMETHYLBENZENE (ALL ISOMERS)	17	
Tetramethylene cyanide	ADIPONITRILE	17	2205
Tetramethylene dicyanide	ADIPONITRILE	17	2205
Tetramethylene glycol	BUTYLENE GLYCOL	17	
Tetramethylene oxide	TETRAHYDROFURAN	17	2056
Tetramethylenesulphone	SULPHOLANE	17	
Tetramethyllead	MOTOR FUEL ANTI-KNOCK COMPOUNDS (CONTAINING LEAD ALKYLs)	17	1649
Tetrapropylbenzene	ALKYL(C9+)BENZENES	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
Tetrapropylenebenzene	DODECYLBENZENE	17	
Tetryl formate	ISOBUTYL FORMATE	17	2393
Thiacyclopentan-1,1-dioxide	SULPHOLANE	17	
4-thiapentanal	3-(METHYLTHIO)PROPIONALDEHYDE	17	
Thiocyclopentan-1,1-dioxide	SULPHOLANE	17	
Thiophan sulphone	SULPHOLANE	17	
Thiosulphuric acid, dipotassium salt	POTASSIUM THIOSULPHATE (50% OR LESS)	17	
Titanium(IV) oxide	TITANIUM DIOXIDE SLURRY	17	
TITANIUM DIOXIDE SLURRY		17	
TOLUENE		17	1294
TOLUENEDIAMINE		17	1709
2,4-Toluenediamine	TOLUENEDIAMINE	17	1709
2,6-Toluenediamine	TOLUENEDIAMINE	17	1709
TOLUENE DIISOCYANATE		17	2078
2-Toluidine	O-TOLUIDINE	17	1708
O-TOLUIDINE		17	1708
Toluol	TOLUENE	17	1294
o-Tolylamine	O-TOLUIDINE	17	1708
2,4-Tolylenediamine	TOLUENEDIAMINE	17	1709
2,6-Tolylenediamine	TOLUENEDIAMINE	17	1709
Tolylenediisocyanate	TOLUENE DIISOCYANATE	17	2078
2,4-Tolylene diisocyanate	TOLUENE DIISOCYANATE	17	2078
m-Tolylene diisocyanate	TOLUENE DIISOCYANATE	17	2078
Toxic anhydride	MALEIC ANHYDRIDE	17	2215
trans-1,3-Pentadiene	1,3-PENTADIENE	17	
Treacle	MOLASSES	18	
Triacetin	GLYOXAL SOLUTION (40% OR LESS)	17	
3,6,9-Triazaundecamethylenediamine	TETRAETHYLENE PENTAMINE	17	2320
3,6,9-Triazaundecane-1,11-diamine	TETRAETHYLENE PENTAMINE	17	2320
TRIBUTYL PHOSPHATE		17	
1,2,3-TRICHLOROBENZENE (MOLTEN)		17	
1,2,4-TRICHLOROBENZENE		17	2321
1,2,3-Trichlorobenzol	1,2,3-TRICHLOROBENZENE (MOLTEN)	17	
1,1,1-TRICHLOROETHANE		17	2831
1,1,2-TRICHLOROETHANE		17	
beta-Trichloroethane	1,1,2-TRICHLOROETHANE	17	
Trichloroethene	TRICHLOROETHYLENE	17	1710
TRICHLOROETHYLENE		17	1710
Trichloromethane	CHLOROFORM	17	1888
1,2,3-TRICHLOROPROPANE		17	
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE		17	
TRICRESYL PHOSPHATE (CONTAINING 1% OR MORE ORTHO-ISOMER)		17	2574
TRICRESYL PHOSPHATE (CONTAINING LESS THAN 1% ORTHO-ISOMER)		17	
TRIDECANE		17	
TRIDECANOIC ACID		17	
Tridecanol	ALCOHOLS (C13+)	17	
Tridecene	OLEFINS (C13+, ALL ISOMERS)	17	
Tridecoic acid	TRIDECANOIC ACID	17	
TRIDECYL ACETATE		17	
Tridecyl alcohol	ALCOHOLS (C13+)	17	
Tridecylbenzene	ALKYL(C9+)BENZENES	17	
Tridecylic acid	TRIDECANOIC ACID	17	
Tridecylic acid	FATTY ACID (SATURATED C13+)	17	
Tri(dimethylphenyl) phosphate	TRIXYLYL PHOSPHATE	17	
TRIETHANOLAMINE		17	
TRIETHYLAMINE		17	1296

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
TRIETHYLBENZENE		17	
TRIETHYLENE GLYCOL		18	
Triethylene glycol butyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Triethylene glycol ethyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Triethylene glycol methyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Triethylene glycol monobutyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
TRIETHYLENETETRAMINE		17	2259
TRIETHYL PHOSPHATE		17	
TRIETHYL PHOSPHITE		17	2323
Triformol	1,3,5-TRIOXANE	17	
Triglycol	TRIETHYLENE GLYCOL	18	
Tri(2-hydroxyethyl)amine	TRIETHANOLAMINE	17	
Trihydroxypropane	GLYCERINE	18	
Trihydroxytriethylamine	TRIETHANOLAMINE	17	
TRIISOPROPANOLAMINE		17	
TRIISOPROPYLATED PHENYL PHOSPHATES		17	
TRIMETHYLACETIC ACID		17	
TRIMETHYLAMINE SOLUTION (30% OR LESS)		17	1297
Trimethylaminomethane	BUTYLAMINE (ALL ISOMERS)	17	1125, 1214
TRIMETHYLBENZENE (ALL ISOMERS)		17	
1,2,3-Trimethylbenzene	TRIMETHYLBENZENE (ALL ISOMERS)	17	
1,2,4-Trimethylbenzene	TRIMETHYLBENZENE (ALL ISOMERS)	17	
1,3,5-Trimethylbenzene	TRIMETHYLBENZENE (ALL ISOMERS)	17	
2,6,6-Trimethylbicyclo[3.1.1]hept-2-ene	ALPHA-PINENE	17	2368
Trimethylcarbinol	TERT-BUTYL ALCOHOL	17	
1,1,3-Trimethyl-3-cyclohexene-5-one	ISOPHORONE	17	
3,5,5-Trimethylcyclohex-2-enone	ISOPHORONE	17	
3,5,5-Trimethylcyclohex-2-en-1-one	ISOPHORONE	17	
3,3'-Trimethylenedioxypentane-1-ol	TRIPROPYLENE GLYCOL	17	
TRIMETHYLOL PROPANE PROPOXYLATED		17	
2,2,4-Trimethylpentane	OCTANE (ALL ISOMERS)	17	1262
2,2,4-TRIMETHYL-1,3-PENTANEDIOL DIISOBUTYRATE		17	
2,2,4-Trimethylpentane-1,3-diol diisobutyrate	2,2,4-TRIMETHYL-1,3-PENTANEDIOL DIISOBUTYRATE	17	
2,2,4-TRIMETHYL-1,3-PENTANEDIOL-1-ISOBUTYRATE		17	
2,4,4-Trimethylpentene-1	DIISOBUTYLENE	17	2050
2,4,4-Trimethylpent-1-ene	DIISOBUTYLENE	17	2050
2,4,4-Trimethylpentene-2	DIISOBUTYLENE	17	2050
2,4,4-Trimethylpent-2-ene	DIISOBUTYLENE	17	2050
2,4,6-Trimethyl-1,3,5-trioxane	PARALDEHYDE	17	1264
2,4,6-Trimethyl-s-trioxane	PARALDEHYDE	17	1264
Trioxan	1,3,5-TRIOXANE	17	
1,3,5-TRIOXANE		17	
5,8,11-Trioxapentadecane	DIETHYLENE GLYCOL DIBUTYL ETHER	17	
3,6,9-Trioxaundecane	DIETHYLENE GLYCOL DIBUTYL ETHER	17	
Trioxin	1,3,5-TRIOXANE	17	
Trioxymethylene	1,3,5-TRIOXANE	17	
Tripropylene	PROPYLENE TRIMER	17	2057
TRIPROPYLENE GLYCOL		17	
Tripropylene glycol methyl ether	POLY(2-8)ALKYLENE GLYCOL MONOALKYL(C1-C6) ETHER	17	
Tris(dimethylphenyl) phosphate	TRIXYLYL PHOSPHATE	17	
N,N,N-Tris(2-hydroxyethyl)amine	TRIETHANOLAMINE	17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
2,4-D-tris(2-hydroxy-2-methylethyl)ammonium	2,4-DICHLOROPHENOXYACETIC ACID, TRIISOPROPANOLAMINE SALT SOLUTION	17	
Tris(2-hydroxypropyl)amine	TRIISOPROPANOLAMINE	17	
Tris(2-hydroxy-1-propyl)amine	TRIISOPROPANOLAMINE	17	
Tris(2-hydroxypropyl)ammonium 2,4-dichlorophenoxyacetate	2,4-DICHLOROPHENOXYACETIC ACID, TRIISOPROPANOLAMINE SALT SOLUTION	17	
Trisodium 2-[carboxylatomethyl(2-hydroxyethyl)amino]ethyliminodi (acetate)	N-(HYDROXYETHYL)ETHYLENEDIAMINETRIAC- ETIC ACID, TRISODIUM SALT SOLUTION	17	
Trisodium N-(carboxymethyl)-N'-(2-hydroxyethyl)-N,N'-ethylenediglycine	N-(HYDROXYETHYL)ETHYLENEDIAMINE TRIACETIC ACID, TRISODIUM SALT SOLUTION	17	
Trisodium N-(2-hydroxyethyl)ethylenediamine-N,N',N'-triacetate	N-(HYDROXYETHYL)ETHYLENEDIAMINETRIACETIC ACID, TRISODIUM SALT SOLUTION	17	
Trisodium nitrilotriacetate solution	NITRILOTRIACETIC ACID, TRISODIUM SALT SOLUTION	17	
Tritolyl phosphate, containing less than 1% ortho-isomer	TRICRESYL PHOSPHATE (CONTAINING LESS THAN 1% ORTHO-ISOMER)	17	
Tritolyl phosphate, containing 1% or more ortho- isomer	TRICRESYL PHOSPHATE (CONTAINING 1% OR MORE ORTHO-ISOMER)	17	2574
Trixylenyl phosphate	TRIXYLYL PHOSPHATE	17	
TRIXYLYL PHOSPHATE		17	
TUNG OIL		17	
TURPENTINE		17	1299
Turpentine oil	TURPENTINE	17	1299
Turps	TURPENTINE	17	1299
Type A Zeolite	SODIUM ALUMINOSILICATE SLURRY	17	
Undecane	N-ALKANES (C10+)	17	
1-Undecanecarboxylic acid	LAURIC ACID	17	
UNDECANOIC ACID		17	
Undecan-1-ol	UNDECYL ALCOHOL	17	
1-UNDECENE		17	
Undec-1-ene	1-UNDECENE	17	
UNDECYL ALCOHOL		17	
Undecylbenzene	ALKYL(C9+)BENZENES	17	
Undecylic acid	UNDECANOIC ACID	17	
n-Undecylic acid	UNDECANOIC ACID	17	
uns-Trimethylbenzene	TRIMETHYLBENZENE (ALL ISOMERS)	17	
Urea, ammonia liquor	UREA/AMMONIUM NITRATE SOLUTION (CONTAINING LESS THAN 1% FREE AMMINIA)	17	
Urea, ammonium carbamate solutions	UREA/AMMONIUM NITRATE SOLUTION (CONTAINING LESS THAN 1% FREE AMMINIA)	17	
UREA/AMMONIUM NITRATE SOLUTION		17	
UREA/AMMONIUM NITRATE SOLUTION (CONTAINING LESS THAN 1% FREE AMMINIA)		17	
UREA/AMMONIUM PHOSPHATE SOLUTION		17	
UREA SOLUTION		17	
Valeral	VALERALDEHYDE (ALL ISOMERS)	17	2058
VALERALDEHYDE (ALL ISOMERS)		17	2058
n-Valeraldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
Valerianic acid	PENTANOIC ACID	17	
Valeric acid	PENTANOIC ACID	17	
n-Valeric acid	PENTANOIC ACID	17	
Valeric aldehyde	VALERALDEHYDE (ALL ISOMERS)	17	2058
Valerone	DIISOBUTYL KETONE	17	
Varnoline	WHITE SPIRIT, LOW (15-20%) AROMATIC	17	1300
VEGETABLE ACID OILS (M)		17	

Index of Products Carried in Bulk

Chapter 19

Index Name	Product Name	Chapter	UN No.
VEGETABLE FATTY ACID DISTILLATES (M)		17	
VEGETABLE PROTEIN SOLUTION (HYDROLYSED)		18	
Vinegar acid	ACETIC ACID	17	
Vinegar naphtha	ETHYL ACETATE	17	
VINYL ACETATE		17	1301
Vinylbenzene	STYRENE MONOMER	17	2055
Vinylcarbinol	ALLYL ALCOHOL	17	1098
Vinyl cyanide	ACRYLONITRILE	17	1093
vinyl ethanoate	VINYL ACETATE	17	1301
VINYL ETHYL ETHER		17	1302
Vinylformic acid	ACRYLIC ACID	17	2218
VINYLDENE CHLORIDE		17	1303
VINYL NEODECANOATE		17	
VINYLTOLUENE		17	2618
Vinyl trichloride	1,1,2-TRICHLOROETHANE	17	
Vitriol brown oil	OLEUM	17	1831
WATER		18	
Water glass	SODIUM SILICATE SOLUTION	17	
WAXES		17	
White bole	KAOLIN SLURRY	18	
White caustic	SODIUM HYDROXIDE SOLUTION	17	1824
WHITE SPIRIT, LOW (15-20%) AROMATIC		17	1300
White tar	NAPHTHALENE (MOLTEN)	17	2304
Wine	ALCOHOLIC BEVERAGES, N.O.S.	18	
Wintergreen oil	METHYL SALICYLATE	17	
Wood alcohol	METHYL ALCOHOL	17	
Wood naphtha	METHYL ALCOHOL	17	
Wood spirit	METHYL ALCOHOL	17	
XYLENES		17	1307
XYLENES/ETHYLBENZENE (10% OR MORE) MIXTURE		17	
XYLENOL		17	2261
2,3-Xylenol	XYLENOL	17	2261
2,4-Xylenol	XYLENOL	17	2261
2,5-Xylenol	XYLENOL	17	2261
2,6-Xylenol	XYLENOL	17	2261
3,4-Xylenol	XYLENOL	17	2261
3,5-Xylenol	XYLENOL	17	2261
Xylols	XYLENES	17	1307
ZINC ALKARYL DITHIOPHOSPHATE (C7-C16)		17	
ZINC ALKENYL CARBOXAMIDE		17	
ZINC ALKYL DITHIOPHOSPHATE (C3-C14)		17	
Zinc bromide drilling brine	DRILLING BRINES (CONTAINING ZINC SALTS)	17	
z-Octadec-9-enamine	OLEYLAMINE	17	
(Z)-Octadec-9-enoic acid	OLEIC ACID	17	
Z-Octadec-9-enoic acid	OLEIC ACID	17	
z-Octadec-9-enylamine	OLEYLAMINE	17	
z-1,3-Pentadiene	1,3-PENTADIENE	17	

Transport of Liquid Chemical Wastes

Chapter 20

Sections 1 to 7

20.1 Preamble

20.1.1 Maritime transport of liquid chemical wastes could present a threat to human health and to the environment.

20.1.2 Liquid chemical wastes shall, therefore, be transported in accordance with relevant international conventions and recommendations and, in particular, where it concerns maritime transport in bulk, with the requirements of this Code.

20.2 Definitions

For the purpose of this chapter:

20.2.1 *Liquid chemical wastes* are substances, solutions or mixtures, offered for shipment, containing or contaminated with one or more constituents which are subject to the requirements of this Code and for which no direct use is envisaged but which are carried for dumping, incineration or other methods of disposal other than at sea.

20.2.2 *Transboundary movement* means maritime transport of wastes from an area under the national jurisdiction of one country to or through an area under the national jurisdiction of another country, or to or through an area not under the national jurisdiction of any country, provided at least two countries are concerned by the movement.

20.3 Applicability

20.3.1 The requirements of this chapter are applicable to the transboundary movement of liquid chemical wastes in bulk by seagoing ships and should be considered in conjunction with all other requirements of this Code.

20.3.2 The requirements of this chapter do not apply to:

- .1 wastes derived from shipboard operations which are covered by the requirements of MARPOL 73/78; and
- .2 substances, solutions or mixtures containing or contaminated with radioactive materials which are subject to the applicable requirements for radioactive materials.

20.4 Permitted shipments

20.4.1 Transboundary movement of wastes is permitted to commence only when:

- .1 notification has been sent by the competent authority of the country of origin, or by the generator or exporter through the channel of the competent authority of the country of origin, to the country of final destination; and

- .2 the competent authority of the country of origin, having received the written consent of the country of final destination stating that the wastes will be safely incinerated or treated by other methods of disposal, has given authorisation to the movement.

20.5 Documentation

20.5.1 In addition to the documentation specified in 16.2 of this Code, ships engaged in transboundary movement of liquid chemical wastes shall carry on board a waste movement document issued by the competent authority of the country of origin.

20.6 Classification of liquid chemical wastes

20.6.1 For the purpose of the protection of the marine environment, all liquid chemical wastes transported in bulk shall be treated as Category X noxious liquid substances, irrespective of the actual evaluated category.

20.7 Carriage and handling of liquid chemical wastes

20.7.1 Liquid chemical wastes shall be carried in ships and cargo tanks in accordance with the minimum requirements for liquid chemical wastes specified in chapter 17, unless there are clear grounds indicating that the hazards of the wastes would warrant:

- .1 carriage in accordance with the ship type 1 requirements; or
- .2 any additional requirements of this Code applicable to the substance or, in case the of a mixture, its constituent presenting the predominant hazard.

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Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Sections 1 to 4

21.1 Introduction

21.1.1 The following criteria are guidelines for the determination of pollution classification and assignment of appropriate carriage requirements for bulk liquid cargoes being considered as candidates for entry into the IBC Code or annexes 1, 3 or 4 of MEPC.2/Circs.

21.1.2 In developing such criteria, every effort has been made to follow the criteria and cut off points developed under the Global Harmonized System (GHS).

21.1.3 Although the criteria are intended to be closely defined in order to establish a uniform approach, it must be emphasised that these are guidelines only and, where human experience or other factors indicates the need for alternative arrangements, these shall always be taken into account. Where deviations from the criteria have been recognised, they shall be properly recorded with justifications.

21.2 Contents

- 21.2.1 This chapter contains the following:
- .1 minimum safety and pollution criteria for products subject to chapter 17 of the IBC Code;
 - .2 criteria used to assign the minimum carriage requirements for products, which meet the safety or pollution criteria to make them subject to chapter 17 of the IBC Code;
 - .3 criteria used for special requirements in chapter 15 of the IBC Code to be included in *column o* of chapter 17 of the IBC Code;
 - .4 criteria used for special requirements in chapter 16 of the IBC Code to be included in *column o* of chapter 17 of the IBC Code; and
 - .5 definitions of properties used within this chapter.

21.3 Minimum safety and pollution criteria for products subject to chapter 17 of the IBC Code

21.3.1 Products are deemed to be hazardous and subject to chapter 17 of the IBC Code if they meet one or more of the following criteria:

- .1 inhalation $LC_{50} \leq 20 \text{ mg/l/4 h}$ (see definitions in paragraph 21.7.1.1);
- .2 dermal $LD_{50} \leq 2000 \text{ mg/kg}$ (see definitions in paragraph 21.7.1.2);
- .3 oral $LD_{50} \leq 2000 \text{ mg/kg}$ (see definitions in paragraph 21.7.1.3);
- .4 toxic to mammals by prolonged exposure (see definitions in paragraph 21.7.2);
- .5 cause skin sensitisation (see definitions in paragraph 21.7.3);
- .6 cause respiratory sensitisation (see definitions in paragraph 21.7.4);
- .7 corrosive to skin (see definitions in paragraph 21.7.5);
- .8 have a Water Reactive Index (WRI) of ≥ 1 (see definitions in paragraph 21.7.6);

- .9 require inertion, inhibition, stabilisation, temperature control or tank environmental control in order to prevent a hazardous reaction (see definitions in paragraph 21.7.10);
- .10 flash point $< 23^\circ\text{C}$; and have an explosive/flammability range (expressed as a percentage by volume in air) of $\geq 20\%$;
- .11 autoignition temperature of $\leq 200^\circ\text{C}$; and
- .12 classified as pollution category X or Y or meeting the criteria for rules 11 to 13 under paragraph 21.4.5.1.

21.4 Criteria used to assign the minimum carriage requirements for products, which meet the minimum safety or pollution criteria to make them subject to chapter 17 of the IBC Code

21.4.1 Column a – Product Name

21.4.1.1 The International Union of Pure and Applied Chemistry (IUPAC) name shall be used as far as possible but, where this is unnecessarily complex, then a technically correct and unambiguous alternative chemical name may be used.

21.4.2 Column b – Deleted.

21.4.3 Column c – Pollution Category

21.4.3.1 *Column c* identifies the pollution category assigned to each product under Annex II of MARPOL 73/78.

21.4.4 Column d – Hazards

21.4.4.1 An “S” is assigned to *column d* if any of the safety criteria described in paragraphs 21.3.1.1 to 21.3.1.11 are met.

21.4.4.2 A “P” is assigned to *column d* if the product meets the criteria for assigning Ship Type 1 to 3 as defined by rules 1 to 14 in paragraph 21.4.5.

Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Section 4

21.4.5 Column e – Ship Type

21.4.5.1 The basic criteria for assigning Ship Types based on the GESAMP Hazard Profile are shown in the table below. An explanation of the details in the columns is provided in appendix 1 of MARPOL Annex II. Selected rules, identified in this table, are specified in section 21.4.5.2 for assigning specific Ship Types.

Rule Number	A1	A2	B1	B2	D3	E2	Ship Type
1			≥5				1
2	≥4	NR	4		CMRTNI		
3	≥4	NR			CMRTNI		2
4			4				
5	≥4		3				
6		NR	3				
7				≥1			
8						Fp	
9					CMRTNI	F	
10			≥2			S	
11	≥4						3
12		NR					
13			≥1				
14	All other category Y Substances						NA
15	All other category Z Substances All “Other Substances” (OS)						

21.4.5.2 The Ship Type is assigned according to the following criteria:

Ship Type 1:

Inhalation $LC_{50} \leq 0.5$ mg//4 h; and/or
Dermal $LD_{50} \leq 50$ mg/kg; and/or
Oral $LD_{50} \leq 5$ mg/kg; and/or
Autoignition temperature $\leq 65^{\circ}\text{C}$; and/or
Explosive range $\geq 50\%$ v/v in air and the flash point $< 23^{\circ}\text{C}$; and/or
Rules 1 or 2 of the table shown in 21.4.5.1

Ship Type 2:

Inhalation $LC_{50} > 0.5$ mg//4 h – ≤ 2 mg//4 h; and/or
Dermal $LD_{50} > 50$ mg/kg – ≤ 1000 mg/kg; and/or
Oral $LD_{50} > 5$ mg/kg – < 300 mg/kg; and/or
WRI=2;
Autoignition temperature $\leq 200^{\circ}\text{C}$; and/or
Explosive range $\geq 40\%$ v/v in air and the flash point $< 23^{\circ}\text{C}$; and/or
Any of the rules 3 to 10 of the table shown in 21.4.5.1

Ship Type 3:

Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 of the IBC Code not meeting the requirements for ship types 1 or 2 and not meeting rule 15 of the table shown in 21.4.5.1.

21.4.6 Column f – Tank type

21.4.6.1 The tank type is assigned according to the following criteria:

Tank type 1G: Inhalation $LC_{50} \leq 0.5$ mg//4 h; and/or
Dermal $LD_{50} \leq 200$ mg/kg; and/or
Autoignition temperature $\leq 65^{\circ}\text{C}$; and/or

Explosive range $\geq 40\%$ v/v in air and the flash point $< 23^{\circ}\text{C}$; and/or WRI=2

Tank type 2G: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 or the IBC Code not meeting the requirements for tank type 1G.

21.4.7 Column g – Tank vents

21.4.7.1 The tank venting arrangements are assigned according to the following criteria:

Controlled: Inhalation $LC_{50} \leq 10$ mg//4 h; and/or
Toxic to mammals by prolonged exposure; and/or
Respiratory sensitiser; and/or
Special carriage control needed; and/or
Flash point $\leq 60^{\circ}\text{C}$
Corrosive to skin (≤ 4 h exposure)

Open: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 or the IBC Code not meeting the requirements for controlled tank vents.

21.4.8 Column h – Tank environmental control

21.4.8.1 The Tank environmental control conditions are assigned according to the following criteria:

Inert: Autoignition temperature $\leq 200^{\circ}\text{C}$; and/or
Reacts with air to cause a hazard; and/or
Explosive range $\geq 40\%$ and the flash point $< 23^{\circ}\text{C}$.

Dry: WRI ≥ 1

Pad: Only applies to specific products identified on a case by case basis.

Vent: Only applies to specific products identified on a case by case basis.

No: Where the above criteria do not apply, (inerting requirements may be required under SOLAS)

Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Section 4

21.4.9 Column i – Electrical equipment

21.4.9.1 If the flash point of the product is $\leq 60^{\circ}\text{C}$ or the product is heated to within 15°C of its flash point then the electrical equipment required are assigned according to the following criteria, else ‘–’ is assigned in column *i'* and *i''*.

.1 Column *i'* – Temperature class:

- T1 Autoignition temperature $\geq 450^{\circ}\text{C}$
- T2 Autoignition temperature $\geq 300^{\circ}\text{C}$ but $< 450^{\circ}\text{C}$
- T3 Autoignition temperature $\geq 200^{\circ}\text{C}$ but $< 300^{\circ}\text{C}$
- T4 Autoignition temperature $\geq 135^{\circ}\text{C}$ but $< 200^{\circ}\text{C}$
- T5 Autoignition temperature $\geq 100^{\circ}\text{C}$ but $< 135^{\circ}\text{C}$
- T6 Autoignition temperature $\geq 85^{\circ}\text{C}$ but $< 100^{\circ}\text{C}$

.2 Column *i''* – Apparatus group:

Apparatus group	MESG at 20°C (mm)	MIC ratio product/methane
IIA	≥ 0.9	> 0.8
IIB	> 0.5 to < 0.9	≥ 0.45 to ≤ 0.8
IIC	≤ 0.5	< 0.45

LR 2.0

Apparatus group	MESG at 20°C (mm)	Test media
IIA	0,9	Propane
IIB	0,65	Ethylene
IIC	0,28	Hydrogen

- .2.1 The tests shall be carried out in accordance with the procedures described in IEC 60079-1-1:2002 and IEC 79-3.
- .2.2 For gases and vapours it is sufficient to make only one determination of either the Maximum Experimental Safe Gap (MESG) or the Minimum Igniting Current (MIC) provided that:
 - for Group IIA: the MESG > 0.9 mm or the MIC ratio > 0.9 .
 - for Group IIB: the MESG is ≥ 0.55 mm and ≤ 0.9 mm; or the MIC ratio is ≥ 0.5 and ≤ 0.8 .
 - for Group IIC: the MESG is < 0.5 mm or the MIC ratio is < 0.45 .
- .2.3 It is necessary to determine both the MESG and the MIC ratio when:
 - .1 The MIC ratio determination only has been made, and the ratio is between 0.8 and 0.9, when an MESG determination will be required;
 - .2 The MIC ratio determination only has been made, and the ratio is between 0.45 and 0.5, when an MESG determination will be required; or

- .3 The MESG only has been found, and is between 0.5 mm and 0.55 mm, when an MIC ratio determination will be required.

.3 Column *i'''* Flash point:

- $> 60^{\circ}\text{C}$:Yes
- $\leq 60^{\circ}\text{C}$:No
- Non-flammable :NF

21.4.10 Column j – Gauging

21.4.10.1 The type of gauging equipment permitted is assigned according to the following criteria:

- Closed: Inhalation $\text{LC}_{50} \leq 2$ mg//4hr; and/or Dermal $\text{LD}_{50} \leq 1000$ mg/kg; and/or Toxic to mammals by prolonged exposure; and/or Respiratory sensitiser; and/or Corrosive to skin (≤ 3 min exposure).
- Restricted: Inhalation $\text{LC}_{50} > 2 - \leq 10$ mg//4h; and/or Special carriage control indicates Inerting required; and/or Corrosive to skin (> 3 min – ≤ 1 h exposure); and/or Flash point $\leq 60^{\circ}\text{C}$.
- Open: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to chapter 17 or the IBC Code not meeting the requirements for closed or restricted gauging.

21.4.11 Column k – Vapour detection

21.4.11.1 The type of vapour detection equipment required is determined by the following criteria:

- Toxic (T): Inhalation $\text{LC}_{50} \leq 10$ mg//4 h, and/or Respiratory sensitiser; and/or Toxic by prolonged exposure.
- Flammable (F): Flash point $\leq 60^{\circ}\text{C}$
- No: Where the above criteria do not apply.

21.4.12 Column l – Fire protection equipment

21.4.12.1 The appropriate fire-fighting media are defined as being appropriate according to the following criteria related to the properties of the product:

- Solubility $> 10\%$ (> 100000 mg//l): A Alcohol-resistant foam.
- Solubility $< 10\%$: (< 100000 mg//l): A Alcohol-resistant foam; and/or B Regular foam.
- WRI = 0: C Water spray (generally used as a coolant and can be used with A and/or B providing that the WRI=0).
- WRI ≥ 1 : D Dry chemical.
- No: No requirements under this Code.
- Note: all appropriate media shall be listed.

21.4.13 Column m – Deleted.

Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Sections 4 & 5

21.4.14 Column n – Emergency Equipment.

21.4.14.1 The requirement to have personnel emergency equipment on board is identified by 'Yes' in *column n* according to the following criteria:

Inhalation LC₅₀ ≤ 2 mg//4 h; and/or
Respiratory sensitiser; and/or
Corrosive to skin (≤ 3 min exposure); and/or
WRI=2

No: indicates that the above criteria do not apply.

21.5 Criteria for special requirements in chapter 15 to be included in *column o*

21.5.1 The assignment of special requirements in *column o* shall normally follow clear criteria based on the data supplied in the reporting form. Where it is considered appropriate to deviate from such criteria, this shall be clearly documented in such a way that it can easily be retrieved on demand.

21.5.2 The criteria for making reference to the special requirements identified in chapters 15 and 16 are defined below with comments where relevant.

21.5.3 Paragraphs 15.2 to 15.10 and 15.20

21.5.3.1 Paragraphs 15.2 to 15.10 and 15.20 identify specific products by name with special carriage requirements that cannot be easily accommodated in any other way.

21.5.4 Paragraph 15.11 – Acids

21.5.4.1 Paragraph 15.11 applies to all acids unless they:

- .1 are organic acids – when only paragraphs 15.11.2 to 15.11.4 and paragraphs 15.11.6 to 15.11.8 apply; or
- .2 do not evolve hydrogen – when paragraph 15.11.5 need not apply.

21.5.5 Paragraph 15.12 – Toxic products

21.5.5.1 All of paragraph 15.12 is added to *column o* according to the following criteria:

Inhalation LC₅₀ ≤ 2 mg//4 h; and/or
the product is a respiratory sensitiser; and/or
the product is toxic to mammals by prolonged exposure.

21.5.5.2 Paragraph 15.12.3 is added to *column o* according to the following criteria:

Inhalation LC₅₀ > 2 – ≤ 10 mg//4 h; and/or
Dermal LD₅₀ ≤ 1000 mg/kg; and/or
Oral LD₅₀ ≤ 300 mg/kg.

21.5.5.3 Paragraph 15.12.4 is added to *column o* according to the following criterion:

Inhalation LC₅₀ > 2 – ≤ 10 mg//4 h.

21.5.6 Paragraph 15.13 – Cargoes protected by additives

21.5.6.1 The requirement to assign paragraph 15.13 to *column o* is based on the information related to the products tendency to polymerise, decompose, oxidise or undergo other chemical changes which may cause a hazard under normal carriage conditions and which would be prevented by the addition of appropriate additives.

21.5.7 Paragraph 15.14 – Cargoes with a vapour pressure greater than atmospheric at 37.8°C

21.5.7.1 The requirement to assign paragraph 15.14 to *column o* is based on the following criterion:

Boiling point ≤ 37.8°C

21.5.8 Paragraph 15.16 – Cargo contamination

21.5.8.1 Paragraph 15.16.1 is deleted.

21.5.8.2 Paragraph 15.16.2 is added to *column o* according to the following criterion:

WRI ≥ 1

21.5.9 Paragraph 15.17 – Increased ventilation requirements

21.5.9.1 Paragraph 15.17 shall be added to *column o* according to the following criteria:

Inhalation LC₅₀ > 0.5 – ≤ 2 mg//4 h; and/or
Respiratory sensitiser; and/or
Toxic to mammals by prolonged exposure; and/or
Corrosive to skin (≤ 1 h exposure time).

21.5.10 Paragraph 15.18 – Special cargo pump-room requirements

21.5.10.1 Paragraph 15.18 shall be added to *column o* according to the following criterion:

Inhalation LC₅₀ ≤ 0.5 mg//4 h

21.5.11 Paragraph 15.19 – Overflow control

21.5.11.1 Paragraph 15.19 shall be added to *column o* according to the following criteria:

Inhalation LC₅₀ ≤ 2 mg//4 h; and/or
Dermal LD₅₀ ≤ 1000 mg/kg; and/or
Oral LD₅₀ ≤ 300 mg/kg; and/or
Respiratory sensitiser; and/or
Corrosive to skin (≤ 3 min exposure); and/or
Autoignition temperature ≤ 200°C; and/or
Explosive range ≥ 40% v/v in air and flash point < 23°C; and/or
Classified as ship type 1 on pollution grounds.

21.5.11.2 Only paragraph 15.19.6 shall apply if the product has any of the following properties:

Inhalation LC₅₀ > 2 mg//4 h – < 10 mg//4 h; and/or
Dermal LD₅₀ > 1000 mg/kg – ≤ 2000 mg/kg; and/or
Oral LD₅₀ > 300 mg/kg – ≤ 2000 mg/kg; and/or
Skin sensitiser; and/or
Corrosive to skin (> 3 min – ≤ 1 h exposure); and/or
Flash point ≤ 60°C; and/or
Classified as ship type 2 on pollution grounds; and/or
Pollution category X or Y.

Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Sections 5, 6 & 7

21.5.12 Paragraph 15.21 – Temperature sensors

21.5.12.1 Paragraph 15.21 is added to *column o* according to the heat sensitivity of the product. This requirement is related to pumps in cargo pump rooms only.

21.6 Criteria for special requirements in chapter 16 to be included in *column o*

21.6.1 Paragraphs 16.1 to 16.2.5 and 16.3 to 16.5

21.6.1.1 These apply to all cargoes and so are not referenced specifically in *column o*.

21.6.2 Paragraph 16.2.6

21.6.2.1 Paragraph 16.2.6 is added to *column o* for products, which meet the following criteria:

Pollution Category X or Y and viscosity ≥ 50 mPa.s at 20°C

21.6.3 Paragraph 16.2.9

21.6.3.1 Paragraph 16.2.9 is added to *column o* for products, which meet the following criterion:

Melting point $\geq 0^\circ\text{C}$.

21.6.4 Paragraph 16.6 – Cargo not to be exposed to excessive heat

21.6.4.1 Paragraphs 16.6.2 to 16.6.4 are added to *column o* for products, which are identified as requiring temperature control during carriage.

21.7 Definitions

21.7.1 Acute mammalian toxicity

21.7.1.1 Acutely toxic by inhalation*

Inhalation toxicity (LC ₅₀)	
Hazard level	mg//4 h
High	≤ 0.5
Moderately high	$>0.5 - \leq 2$
Moderate	$>2 - \leq 10$
Slight	$>10 - \leq 20$
Negligible	>20

21.7.1.2 Acutely toxic in contact with skin

Dermal toxicity (LD ₅₀)	
Hazard level	mg/kg
High	≤ 50
Moderately high	$>50 - \leq 200$
Moderate	$>200 - \leq 1000$
Slight	$>1000 - \leq 2000$
Negligible	>2000

21.7.1.3 Acutely toxic if swallowed

Oral toxicity (LD ₅₀)	
Hazard level	mg/kg
High	≤ 5
Moderately high	$>5 - \leq 50$
Moderate	$>50 - \leq 300$
Slight	$>300 - \leq 2000$
Negligible	>2000

21.7.2 Toxic to mammals by prolonged exposure

21.7.2.1 A product is classified as *toxic by prolonged exposure* if it meets any of the following criteria: it is known to be, or suspected of being a carcinogen, mutagen, reprotoxic, neurotoxic, immunotoxic or exposure below the lethal dose is known to cause specific organ oriented systemic toxicity (TOST) or other related effects.

21.7.2.2 Such effects may be identified from the GESAMP Hazard Profile of the product or other recognised sources of such information.

21.7.3 Skin sensitisation

21.7.3.1 A product is classified as a *skin sensitizer*:

- .1 if there is evidence in humans that the substance can induce sensitisation by skin contact in a substantial number of persons; or
- .2 where there are positive results from an appropriate animal test.

21.7.3.2 When an adjuvant type test method for skin sensitisation is used, a response of at least 30% of the animals is considered as positive. For a non-adjuvant test method a response of at least 15% of the animals is considered positive.

* All inhalation toxicity data are assumed to be associated with vapours and not mists or sprays, unless indicated otherwise.

Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Section 7

21.7.3.3 When a positive result is obtained from the Mouse Ear Swelling Test (MEST) or the Local Lymph Node Assay (LLNA), this may be sufficient to classify the product as a skin sensitiser.

21.7.4 Respiratory sensitisation

- 21.7.4.1. A product is classified as a *respiratory sensitiser*:
- .1 if there is evidence in humans that the substance can induce specific respiratory hypersensitivity; and/or
 - .2 where there are positive results from an appropriate animal test; and/or
 - .3 where the product is identified as a skin sensitiser and there is no evidence to show that it is not a respiratory sensitiser.

21.7.5 Corrosive to skin*

Hazard Level	Exposure time to cause full thickness necrosis of skin	Observation time
Severely corrosive to skin	≤3 min	≤1 h
Highly corrosive to skin	>3 min - ≤1 h	≤14 days
Moderately corrosive to skin	>1 h - ≤4 h	≤14 days

21.7.6 Water reactive substances

21.7.6.1 These are classified into three groups as follows:

Water reactive index (WRI)	Definition
2	Any chemical which, in contact with water, may produce a toxic, flammable or corrosive gas or aerosol.
1	Any chemical which, in contact with water, may generate heat or produce a non-toxic, non-flammable or non corrosive gas.
0	Any chemical which, in contact with water, would not undergo a reaction to justify a value of 1 or 2.

21.7.7 Air reactive substances

21.7.7.1 Air reactive substances are products which react with air to cause a potentially hazardous situation, e.g. the formation of peroxides which may cause an explosive reaction.

21.7.8 Electrical apparatus – Temperature Class (for products which either have a flashpoint of ≤60°C or are heated to within 15°C of their flashpoint).

21.7.8.1 The Temperature Class is defined by the International Electrotechnical Commission (IEC) as:

The highest temperature attained under practical conditions of operation within the rating of the apparatus (and recognised overloads, if any, associated therewith) by any part of any surface, the exposure of which to an explosive atmosphere may involve a risk.

21.7.8.2 The Temperature Class of the electrical apparatus is assigned by selecting the Maximum Surface Temperature which is closest to, but less than, the product's autoignition temperature (see 21.4.9.1.1).

21.7.9 Electrical apparatus – Apparatus group (for products with a flashpoint of ≤60°C)

21.7.9.1 This refers to intrinsically safe and associated electrical apparatus for explosive gas atmospheres which the IEC divide into the following groups:

- Group I: for mines susceptible to firedamp (not used by IMO); and
- Group II: for applications in other industries – further sub-divided according to its Maximum Experimental Safe Gap (MESG) and/or the Minimum Igniting Current (MIC) of the gas/vapour into groups IIA, IIB and IIC.

21.7.9.2 This property cannot be determined from other data associated with the product; it has to be either measured or assigned by assimilation with related products in an homologous series.

21.7.10 Special carriage control conditions

21.7.10.1 Special carriage control conditions refer to specific measures that need to be taken in order to either prevent a hazardous reaction. They include:

- .1 **Inhibition:** the addition of a compound (usually organic) that retards or stops an undesired chemical reaction such as corrosion, oxidation or polymerisation;
- .2 **Stabilisation:** the addition of a substance (stabiliser) that tends to keep a compound, mixture or solution from changing its form or chemical nature. Such stabilisers may retard a reaction rate, preserve a chemical equilibrium, act as antioxidants, keep pigments and other components in emulsion form or prevent the particles in colloidal suspension from precipitating;
- .3 **Inertion:** the addition of a gas (usually nitrogen) in the ullage space of a tank that prevents the formation of a flammable cargo/air mixture;
- .4 **Temperature control:** the maintenance of a specific temperature range for the cargo in order to prevent a hazardous reaction or to keep the viscosity low enough to allow the product to be pumped; and
- .5 **Padding and venting:** only applies to specific products identified on a case by case basis.

* Products that are corrosive to skin are, for the purpose of assigning relevant carriage requirements, deemed to be corrosive by inhalation.

Criteria for Assigning Carriage Requirements for Products Subject to the IBC Code

Chapter 21

Section 7

21.7.11 Flammable cargoes

21.7.11.1 A cargo is defined as flammable according to the following criteria:

IBC Code descriptor	Flash point (degrees Centigrade)
Highly flammable	<23
Flammable	≤60 but ≥23

21.7.11.2 It should be noted that flash points of mixtures and aqueous solutions need to be measured unless all of the components are non-flammable.

21.7.11.3 It should be noted that the carriage of bulk liquid cargoes which have a flash point of ≤60°C is subject to other SOLAS regulations.

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